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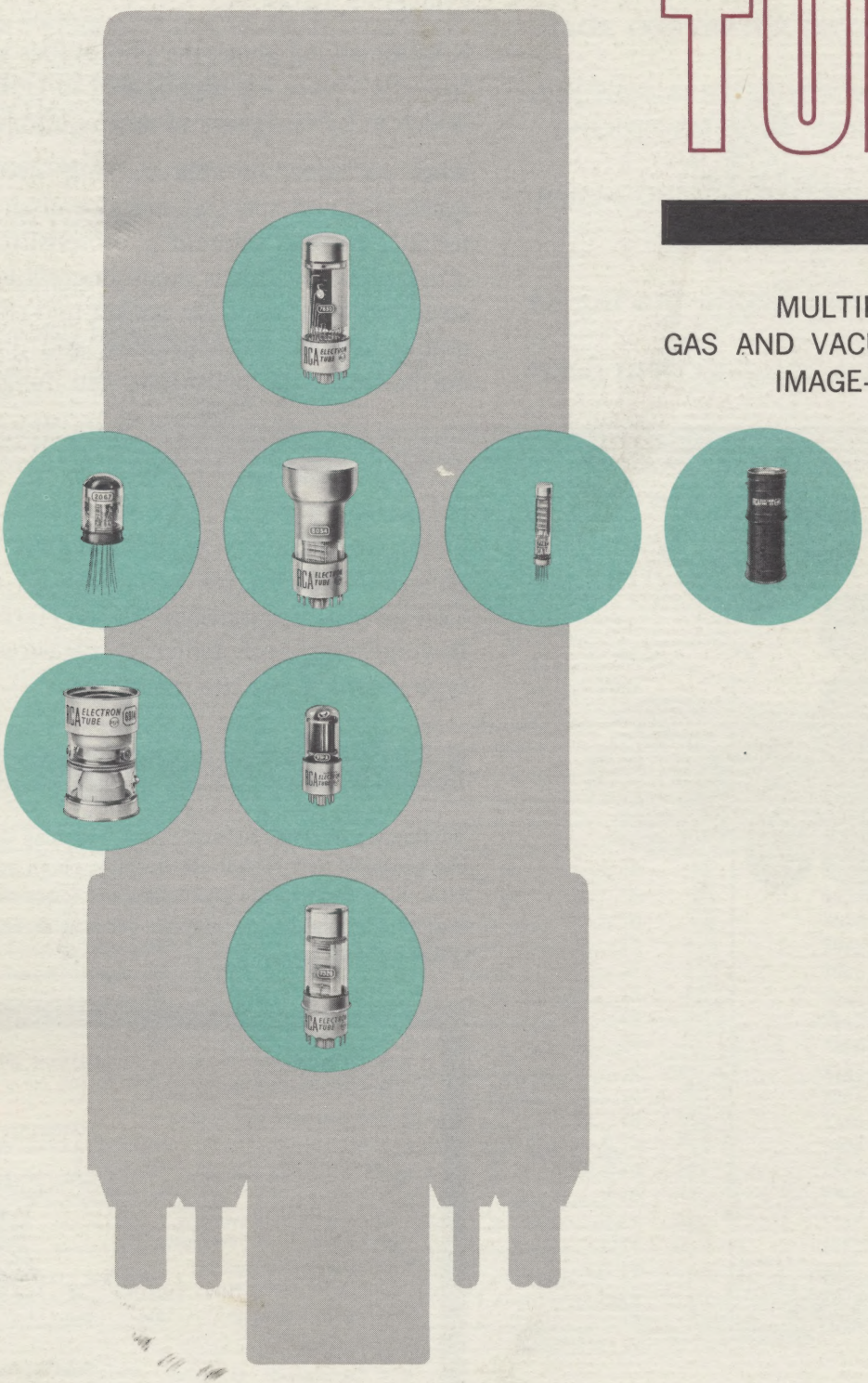
RCA PHOTO AND IMAGE TUBES



MULTIPLIER PHOTOTUBES
GAS AND VACUUM PHOTODIODES
IMAGE-CONVERTER TUBES

RADIO CORPORATION OF AMERICA • ELECTRON TUBE DIVISION • HARRISON, N. J.

*OPTIONAL LIST PRICE

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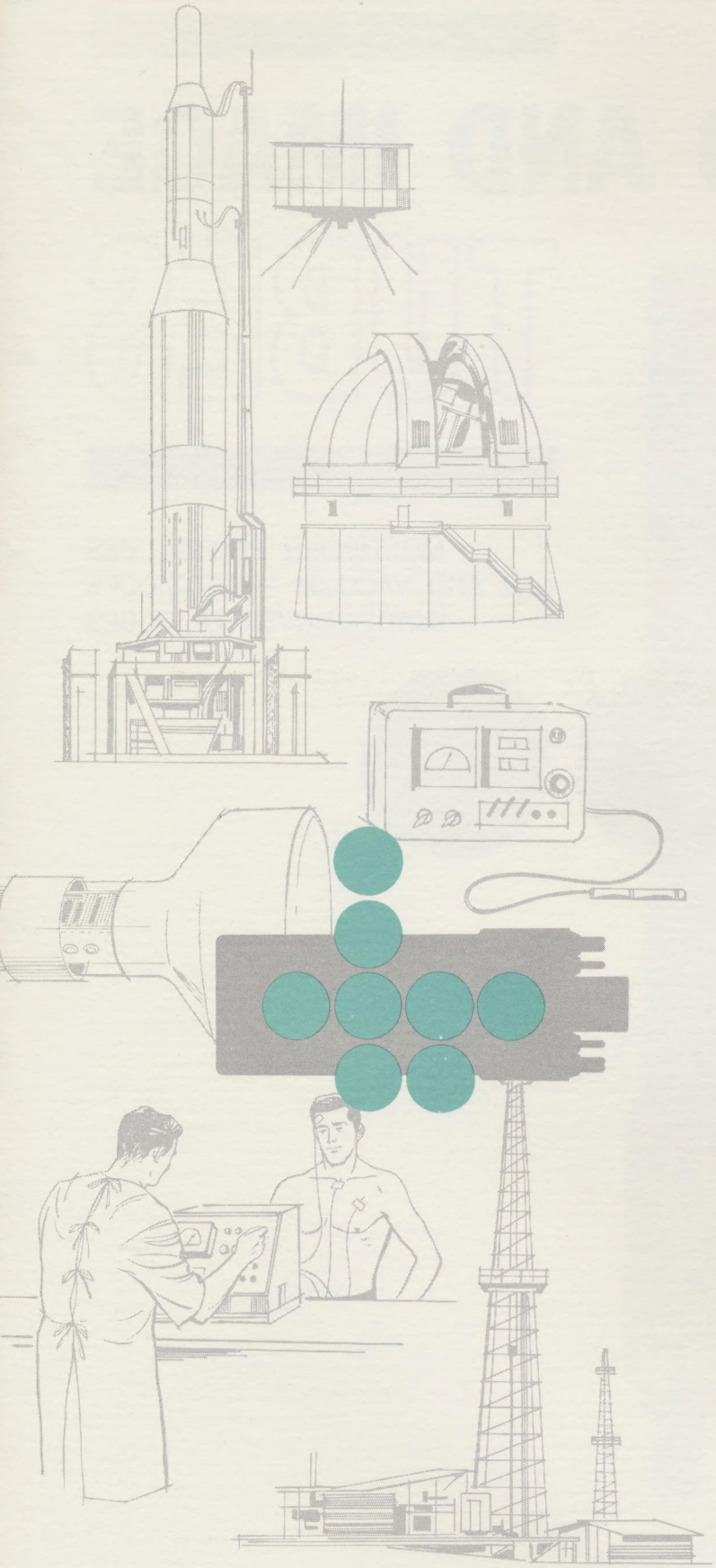


RCA PHOTO and IMAGE TUBES

THIS CATALOG provides concise technical information on RCA Multiplier Phototubes, Vacuum and Gas Photodiodes, and Image-Converter Tubes.

Recommended multiplier phototubes and image-converter tubes are highlighted to facilitate type selection by designers of new equipment.

Also included in this catalog are spectral-sensitivity and spectral-energy-emission characteristics for the different photosensitive devices, quick-selection charts specifying phototube construction and materials, socket and shield information for RCA phototubes, and dimensional outlines for each phototube and image tube.

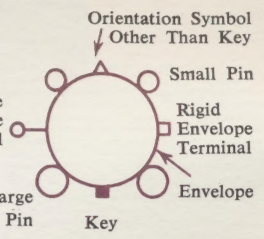
The detailed information shown in this catalog for single- and twin-unit phototubes is suitable for design purposes. For other types, more complete information is available in the individual technical bulletin for each type on request to Commercial Engineering, RCA, Harrison, N. J. In requesting such bulletins, please specify the type in which you are interested.

Information on other RCA products, including developmental photosensitive devices that are available on an active sampling basis and variants of the phototubes and image-converter tubes described in this catalog, may be obtained at any of the field offices listed on page 31.

KEY TO BASE AND ENVELOPE CONNECTION DIAGRAMS

Diagrams show terminals viewed from the base end of the type

C_b = Balancing Capacitance
CL = Collector
DJ = Deflecting Electrode
DY = Dynode
G = Grid
IC = Internal Connection —Do Not Use
NC = No Connection
P = Anode
K = Photocathode U = Unit
• = Gas-Type Tube



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RECOMMENDED MULTIPLIER PHOTOTUBES

VERY "FAST" RESPONSE TYPES

RCA-7746—A 2″-diameter, 10-stage, head-on type having S-11 spectral response and utilizing an enclosed, in-line dynode structure. Dynode material is copper beryllium. Has a spherical faceplate and spherical photocathode to enhance uniform photoelectron collection from all parts of the useful photocathode.

RCA-7850—A 2″-diameter, 12-stage version of the 7746. Provides very high current amplification in conjunction with extremely short rise time.

These two tube types have a median pulse height resolution of 8.5 per cent and are highly recommended for—

- *Coincidence scintillation counting*
- *Nuclear "time-of-flight" measurements*
- *For the detection and measurement of Cerenkov radiation*

VENETIAN-BLIND DYNODE TYPES

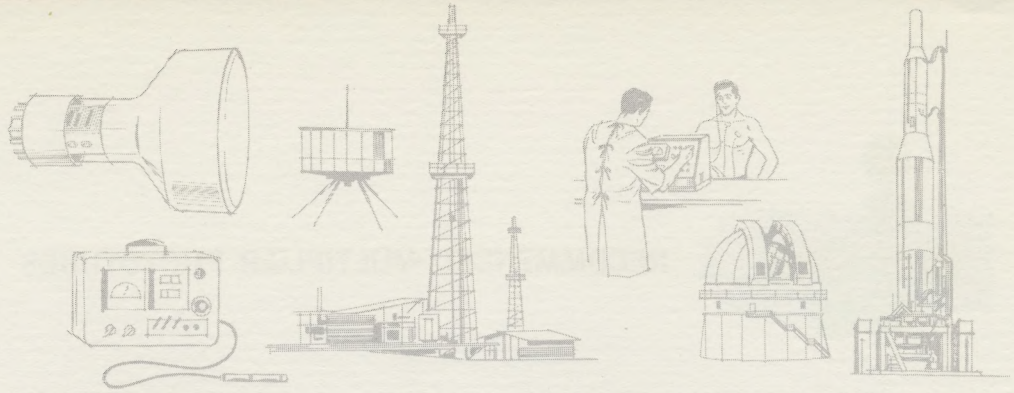
RCA-8053—A 2″-diameter, 10-stage, head-on type utilizing a venetian-blind dynode structure. Has a flat faceplate and flat photocathode. Spectral response is S-11; dynode material is copper beryllium.

RCA-8054—A 3″-diameter version of the 8053.

RCA-8055—A 5″-diameter version of the 8053.

These three tube types may be used interchangeably as the need for larger or smaller diameter phototubes is required. They are specifically designed for—

- *General scintillation counter applications*
- *Flying-spot scanning systems*



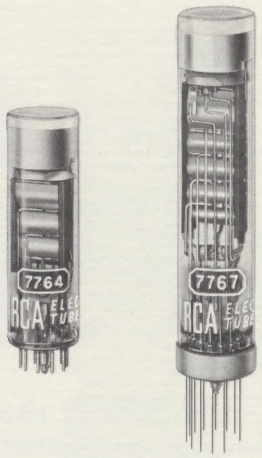
¾"-DIAMETER TYPES

RCA-7764—A very short ¾"-diameter, 6-stage, head-on type having a flat faceplate and a curved photocathode. Has S-11 spectral response and utilizes an in-line dynode structure. Dynode material is copper beryllium.

RCA-7767—A 10-stage version of the 7764 but has higher current amplification capability and utilizes semi-flexible leads.

These two tube types are recommended for—

- *Geological and medical probe applications*
- *Scintillation counting applications*
- *Systems requiring minimum phototube size*



"FAST" RESPONSE TYPES

RCA-6342A—A 2"-diameter, 10-stage, head-on type having a flat faceplate and a curved photocathode. Has S-11 spectral response and utilizes copper-beryllium dynodes.

RCA-6655A — Similar to type 6342A but utilizes cesium-antimony dynodes.

RCA-6810A—A 2"-diameter, 14-stage, head-on type having a flat faceplate and a curved photocathode. Has S-11 spectral response and utilizes an in-line dynode structure. Dynode material is copper beryllium.

These three tube types have proven their capabilities in—

- *Scintillation counting applications*
- *Low-level-radiation detection and measurement systems*

RECOMMENDED MULTIPLIER PHOTOTUBES

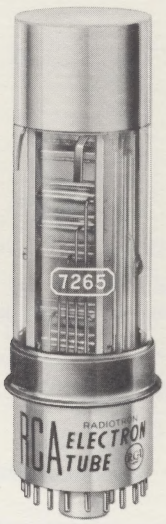
MULTIALKALI TYPES

RCA-7265—A 2″-diameter, 14-stage, head-on type having a flat faceplate and a curved photocathode. Has S-20 spectral response. This photocathode provides very high quantum efficiency which extends into the "red" region of the visible spectrum. Dynode material is copper beryllium.

RCA-7326—A 2″-diameter, 10-stage, head-on type having a flat faceplate and a curved photocathode. Has S-20 spectral response. Dynode material is silver magnesium.

These two tube types have very high response to "red" radiation and are recommended for—

- *Scintillation counting applications*
- *Color flying-spot equipment*
- *Applications requiring extremely high "red" sensitivity*

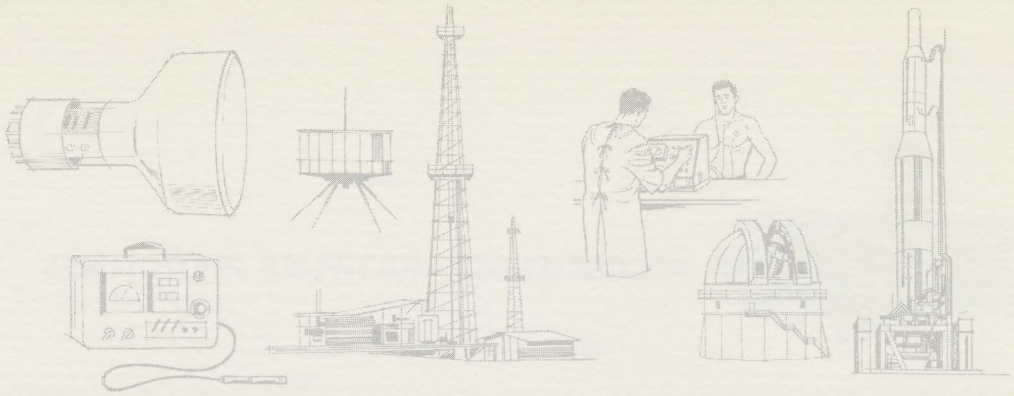


DORMER-WINDOW TYPE

RCA-7029—A 10-stage, dormer-window type having S-17 spectral response. The photosurface is deposited on a reflective substrate which results in extremely high quantum efficiency. Dynode material is cesium antimony.

This tube type is designed for the detection and measurement of low-level light signals in the presence of relatively high background illumination. It has been used extensively in—

- *Stellar navigation applications*
- *Low contrast measurements*



"RUGGEDIZED" TYPES

RCA-4441—A 1½"-diameter, 10-stage, head-on type having a flat faceplate and a flat photocathode. Has S-11 spectral response and utilizes cesium-antimony dynodes. Has semiflexible leads, and a special metal flange cathode terminal.

RCA-2067—Similar to type 4441 except employs a hemispherical faceplate for increased radiation collection over a solid angle of greater than 2π steradians.

RCA-4438—Similar to type 4441 electrically but photocathode connection is maintained by a special spring-finger contact. Has semiflexible leads.

RCA-4439—Identical with type 4438 but supplied with base attached to semiflexible leads to facilitate testing.

RCA-4440—Identical with type 4438 except supplied with attached base.

These five tube types provide dependable phototube performance under severe conditions of shock and vibration and are intended for use in—

- *Missile applications*
- *Rocket applications*
- *Military systems*

RECOMMENDED MULTIPLIER PHOTOTUBES

SIDE-ON TYPES

RCA-1P21—A 9-stage, side-on type designed especially for critical applications requiring extremely low dark current and high current amplification. Has S-4 spectral response. Dynode material is cesium antimony.

RCA-931A—Similar to type 1P21 but intended for applications having relaxed dark current and minimum sensitivity requirements.

These two tube types are perhaps the most popular of all multiplier phototubes and are used extensively in—

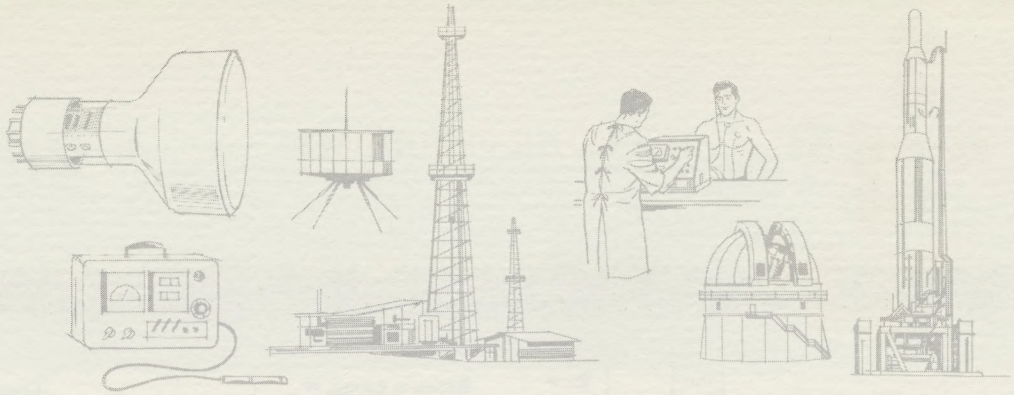
- *Light-operated control applications*
- *X-radiation exposure controls*
- *Light-flux meters*
- *Flying-spot signal generators*
- *Scintillation counters*
- *Facsimile*

HIGH PHOTOCATHODE CURRENT TYPE

RCA-2020—A 2″-diameter, 10-stage, head-on type having S-11 spectral response. Employs a photocathode deposited over opaque conductive strips of high electrical conductivity. Has copper-beryllium dynodes.

This tube type is highly recommended for use in—

- *Applications involving high peak photocathode currents without defocusing effects*



FOR UV APPLICATIONS

RCA-1P28—A 9-stage, side-on type having S-5 spectral response. The response covers the approximate range from 2000 to 6000 angstroms with a maximum at 3400 angstroms. Dynode material is cesium antimony. Employs a special ultraviolet-transmitting-glass window.

RCA-6903—A 2″-diameter, 10-stage, head-on type having a flat faceplate and a flat photocathode. Has S-13 spectral response which covers the approximate range from 1800 to 6500 angstroms. Maximum response occurs at 4400 angstroms. Utilizes a fused-silica faceplate. Dynode material is cesium antimony.

RCA-7200—A 9-stage, side-on type having S-19 spectral response. Approximate response range is 1800 to 6000 angstroms with a maximum at 3300 angstroms. Employs a fused-silica window. Dynode material is cesium antimony.

These three types are intended for—

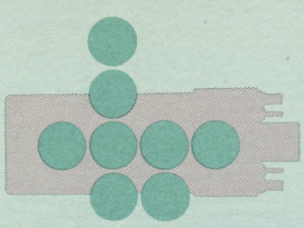
- *UV spectroscopy*
- *Other ultraviolet and visible radiation measurements*

FOR NEAR-INFRARED APPLICATIONS

RCA-7102—A 1½″-diameter, 10-stage, head-on type having a flat faceplate and a flat photocathode. Has S-1 spectral response covering the approximate range from 4200 to 11,000 angstroms. Maximum response occurs at 8000 angstroms. Dynode material is silver magnesium.

This tube is designed for low level "red" and near-infrared radiation applications including—

- *Laser detectors*
- *Optical pyrometry*
- *IR communications*
- *Astronomy*



MULTIPLIER PHOTOTUBES

RCA Type	Description	Outline, Basing Diagram a	Spectral Response b	Wavelength of Max. Spectral Response angstroms	Maximum Ratings cd				Characteristics					
					SUPPLY VOLTAGE			Average Anode Current f	Supply Voltage (E) Between Anode and Cathode dc volts	SENSITIVITY		Current Amplification	Max. Equiv. Anode-Dark-Current Input j lumen	Equiv. Noise Input k lumen
					Ee dc or peak ac volts	Between Anode and Final Dynode dc or peak ac volts	Dynode No. 1 dc or peak ac volts	ma		Radiant g amp/watt	Luminous h amp/lumen			
1P21	9-stage type for critical applications involving extremely low light levels.	38	S-4	4000	1250	250	250	0.1	1000m	78000	80	2×10^6	5×10^{-10}	5×10^{-13}
1P22	9-stage type having response similar to that of eye. Especially useful in colorimetry.	38	S-8	3650	1250	250	—	1.0	1000m	750	1.0	3.3×10^5	3.75×10^{-7} n	7.5×10^{-12}
1P28	9-stage type for applications involving very low ultraviolet radiation levels.	38	S-5	3400	1250	250	—	0.5	1000m	61800	50	1.25×10^6	1.25×10^{-9}	7.5×10^{-13}
931A	9-stage type for use in light-operated relays, X-ray exposure control, and facsimile transmission.	38	S-4	4000	1250	250	—	1.0	1000m	24000	24	0.8×10^6	2.5×10^{-9}	9.5×10^{-13}
2020	10-stage, head-on, flat-face type similar to 6342A but having low-resistivity photocathode.	19	S-11	4400	1500	250	400p	2.0	1250q 1500q	4800 22000	6 28	1.2×10^5 5.6×10^5	2.25×10^{-9} —	7×10^{-12} —
2067	"Ruggedized", 10-stage, head-on type having hemispherical faceplate. For compact missile and satellite applications.	40	S-11	4400	1250	250	300	0.75	1000q	12000	15	3.3×10^5	2.5×10^{-9}	6.6×10^{-12}
4438 4439 4440	"Ruggedized", 10-stage, head-on types having flat faceplates. For missile and satellite applications. Type 4438 has semiflexible leads. Type 4439 has base attached to semiflexible leads. Type 4440 is supplied with a base.	35 35 31	S-11	4400	1250	250	300	0.75	1000q	22000	27	6×10^5	2.5×10^{-9}	4×10^{-12}
4441	"Ruggedized", 10-stage, head-on type similar to the 4438 but has special photocathode connection which assures continuous cathode contact under rough tube usage.	37	S-11	4400	1250	250	300	0.75	1000q	22000	27	6×10^5	2.5×10^{-9}	4×10^{-12}
5819	10-stage, head-on type for scintillation counters and other low-level light sources.	24	S-11	4400	1250	250	300	0.75	1000q	20000	25	5×10^5	2×10^{-9}	7×10^{-12}
6199	10-stage, head-on, flat-face type having small size for use in portable scintillation counters.	30	S-11	4400	1250	250	300	0.75	1000q	22000	27	6×10^5	2.5×10^{-9}	4×10^{-12}
6217	10-stage type for color densitometers and spectrometers.	24	S-10	4500	1250	250	—	0.75	1000q	12000	24	6×10^5	2.5×10^{-8}	4×10^{-11}

a For Dimensional Outlines and Basing Diagrams, see pages 20 through 27.
b For Spectral Sensitivity Curves, see pages 18 and 19.
c Absolute values.
d The maximum ambient-temperature rating of all multiplier types is 75°C except for type 1P22 which is limited to 50°C and types 7265 and 7326 which are limited to 85°C.
e Between anode and cathode.
f Averaged over any interval of 30 seconds maximum.
g At wavelength of maximum spectral response for each type.
h On basis of tungsten-filament light source having a lime-glass envelope, operated at 2870°K.
j At 25°C and with supply voltage (E) adjusted to give luminous sensitivity of 20 amperes per lumen, except as noted.
k Under conditions of 25°C tube temperature, tungsten-filament light source at 2870°K, and bandwidth of 1 cps.
m Supply voltage (E) across voltage divider providing 1/10 of E between cathode and dynode No. 1; 1/10 of E for each succeeding dynode stage; and 1/10 of E between dynode No. 9 and anode.
n At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 0.4 ampere per lumen.
p This value is also the maximum focusing-electrode voltage.
q Supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode. If type has focusing electrode, it is connected to dynode No. 1 at socket.

MULTIPLIER PHOTOTUBES

RCA Type	Description	Outline, Basing Diagram [a]	Spectral Response [b]	Wavelength of Max. Spectral Response angstroms	Maximum Ratings [cd] SUPPLY VOLTAGE Between Anode and Cathode [e] dc or peak ac volts	Between Anode and Final Dynode dc or peak ac volts	Dynode No. 1 dc or peak ac volts	Average Anode Current [f] ma	Characteristics: Supply Voltage (E) Between Anode and Cathode dc volts	SENSITIVITY Radiant [g] amp/watt	SENSITIVITY Luminous [h] amp/lumen	Current Amplification	Max. Equiv. Anode-Dark-Current Input [j] lumen	Equiv. Noise Input [k] lumen
6328	Short, sturdy, 9-stage type for ac automobile-headlight-control service.	39	S-4	4000	1400[y]	250[y]	—	0.1	1000[m]	34000	35	—	—	—
6342A	10-stage, head-on, flat-face type with focusing electrode. Especially useful for fast coincidence scintillation counting.	19	S-11	4400	1500	250	400[n]	2.0	1250[p]	14000	18	2.25×10^5	2×10^{-9}	7×10^{-12}
6472	Short, sturdy, 9-stage type with flexible leads for automobile - headlight - control service.	42	S-4	4000	1250	250	—	0.1	1000[m]	34000	35	—	—	—
6655A	10-stage, head-on, flat-face type with focusing electrode. For use in scintillation counters.	19	S-11	4400	1250	250	300[n]	0.75	1000[p]	40000	50	9×10^5	2×10^{-9}	7×10^{-12}
6810A	14-stage, head-on, flat-face type with focusing electrode. Especially useful for fast coincidence scintillation counting.	8	S-11	4400	2400[q]	400[q]	400[nq]	2.0	2000	700000	875	12.5×10^6	2×10^{-9} [r]	3.3×10^{-12}
6903	10-stage, head-on, flat-face type with focusing electrode. Especially useful for detection and measurement of ultraviolet radiation.	25	S-13	4400	1250	250	300[n]	0.75	1000[p]	19000	24	4×10^5	6×10^{-9}	6.7×10^{-12}
7029	10-stage, dormer-window type with extremely high cathode-sensitivity. Especially useful in low-contrast applications.[s]	36	S-17	4900	1250	250	300	0.02	1000[t]	27000	40	3.2×10^5	4×10^{-10} [u]	1.1×10^{-11}
7046	14-stage, head-on, flat-face type with $4\frac{7}{16}$"-diameter cathode and 2 focusing electrodes. Especially useful for gamma-ray spectrometry.	1	(v)	4200	3400[q]	400[q]	—	2.0	2800	140000	180	3×10^6	1.2×10^{-8} [w]	1×10^{-11}
7102	10-stage, head-on, flat-face type. Especially useful for detection and measurement of red and near-infrared radiation.	30	S-1	8000	1500	250	400	0.01	1250[p]	420	4.5	1.5×10^5	5×10^{-6} [x]	1.5×10^{-10}
7117	Short, sturdy, 9-stage type for dc automobile-headlight-control service.	39	S-4	4000	1250[q]	250[q]	—	0.1	1000[m]	34000	35	—	—	—

a For Dimensional Outlines and Basing Diagrams, see pages 20 through 27.
b For Spectral Sensitivity Curves, see pages 18 and 19.
c Absolute values.
d The maximum ambient-temperature rating of all multiplier types is 75°C except for type 1P22 which is limited to 50°C and types 7265 and 7326 which are limited to 85°C.
e Between anode and cathode.
f Averaged over any interval of 30 seconds maximum.
g At wavelength of maximum spectral response for each type.
h On basis of tungsten-filament light source having a lime-glass envelope, operated at 2870°K.
j At 25°C and with supply voltage (E) adjusted to give luminous sensitivity of 20 amperes per lumen, except as noted.
k Under conditions of 25°C tube temperature, tungsten-filament light source at 2870°K, and bandwidth of 1 cps.
m Supply voltage (E) across voltage divider providing 1/10 of E between cathode and dynode No. 1; 1/10 of E for each succeeding dynode stage; and 1/10 of E between dynode No. 9 and anode.
n This value is also the maximum focusing-electrode voltage.
p Supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode. If type has focusing electrode, it is connected to dynode No. 1 at socket.
q DC only.
r At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 2000 amperes per lumen.
s Has altitude rating of 60,000 feet.
t Supply voltage (E) across voltage divider providing 1/11 of E per stage.
u Median value.
v Extended S-11 response covering range from about 2500 to 6500 angstroms.
w At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 500 amperes per lumen.
x At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 4 amperes per lumen.
y AC only.

MULTIPLIER PHOTOTUBES

RCA Type	Description	Outline, Basing Diagram [a]	Spectral Response [b]	Wavelength of Max. Spectral Response angstroms	Maximum Ratings [cd]				Characteristics					
					SUPPLY VOLTAGE			Average Anode Current [f] ma	Supply Voltage (E) Between Anode and Cathode dc volts	SENSITIVITY		Current Amplification	Max. Equiv. Anode-Dark-Current Input [j] lumen	Equiv. Noise Input [k] lumen
					Ee dc or peak ac volts	Between Anode & Final Dynode dc or peak ac volts	Dynode No. 1 dc or peak ac volts			Radiant [g] amp/watt	Luminous [h] amp/lumen			
7200	9-stage, side-on type. For detection and measurement of ultraviolet radiation.	26	S-19	3300	1250	250	—	0.5	1000[m]	65000	40	1×10^6	2×10^{-9}	7.5×10^{-13}
7264	14-stage, head-on type with spherical faceplate. Has focusing and accelerating electrodes. For detection and measurement of nuclear radiation.	7	S-11	4400	2400[n]	400[n]	400[np]	2	2000	700000	875	12.5×10^6	2×10^{-9}[q]	3.3×10^{-12}
7265	14-stage, head-on, flat-face type. Especially useful in scintillation counters, flying-spot scanners, and photometers.	12	S-20	4200	3000[n]	500[n]	500[np]	1	2400	1300000	3000	20×10^6	8×10^{-10}[r]	7.5×10^{-13}
7326	10-stage, head-on, flat-face type. Especially useful in scintillation counters, flying-spot scanners, and photometers.	13	S-20	4200	2400[n]	500[n]	500[np]	1	1800[s]	9600	22.5	1.5×10^5	1.4×10^{-9}	1.9×10^{-12}
7746	10-stage, head-on type with spherical faceplate. For use with Cerenkov and other nuclear radiation. Has typical pulse height resolution of 8.5 per cent.	18	S-11	4400	2500[n]	400[n]	600[np]	2	2000	960000	1200	17×10^6	3.5×10^{-10}[t]	6×10^{-12}
7764	Very short, 6-stage, head-on type having max. diameter of only ¾" and overall length of about 2¾". Useful where space is very restricted.	41	S-11	4400	1500	300	400	0.5	1200[u]	240	0.3	5×10^3	3×10^{-8}[v]	3×10^{-10}
7767	Small, ¾"-diameter, 10-stage, head-on type having flexible leads. For use in probes, in underground geological exploration, and biological tracer studies.	32	S-11	4400	1500	300	400	0.5	1250[w]	6000	7.5	1.25×10^5	5×10^{-9}[x]	3×10^{-12}
7850	12-stage, head-on type with spherical faceplate. For use with Cerenkov and other nuclear radiation. Has typical pulse height resolution of 8.5 per cent.	14	S-11	4400	2600[n]	400[n]	600[np]	2	2300	4800000	6000	8.6×10^7	2.5×10^{-9}[∝]	3×10^{-12}
8053	10-stage, 2"-diameter, head-on type employing a venetian-blind dynode structure. For general scintillation counting applications.	20	S-11	4400	2000[n]	300[n]	600[np]	2	1500	15000	19	2.5×10^5	9×10^{-13}[yz]	3.3×10^{-15}[z]
8054	10-stage, 3"-diameter, head-on type employing a venetian-blind dynode structure. For general scintillation counting applications.	6	S-11	4400	2000[n]	300[n]	600[np]	2	1500	15000	19	2.5×10^5	9×10^{-13}[yz]	3.3×10^{-15}[z]
8055	10-stage, 5"-diameter, head-on type employing a venetian-blind dynode structure. For general scintillation counting applications.	2	S-11	4400	2000[n]	300[n]	600[np]	2	1500	15000	19	2.5×10^5	9×10^{-13}[yz]	3.3×10^{-15}[z]

a For Dimensional Outlines and Basing Diagrams, see pages 20 through 27.
b For Spectral Sensitivity Curves, see pages 18 and 19.
c Absolute values.
d The maximum ambient-temperature rating of all multiplier types is 75° C except for type 1P22 which is limited to 50° C and types 7265 and 7326 which are limited to 85° C.
e Between anode and cathode.
f Averaged over any interval of 30 seconds maximum.
g At wavelength of maximum spectral response for each type.
h On basis of tungsten-filament light source having a lime-glass envelope operated at 2870° K.
j At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 20 amperes per lumen, except as noted.
k Under conditions of 25° C tube temperature, tungsten-filament light source of 2870° K, and bandwith of 1 cps.
m Supply voltage (E) across voltage divider providing 1/10 of E between cathode and dynode No. 1; 1/10 of E for each succeeding dynode stage; and 1/10 of E between dynode No. 9 and anode.
n DC only.
p This value is also the maximum focusing-electrode voltage.
q At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 2000 amperes per lumen.
r At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 1000 amperes per lumen.
s Supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; focusing electrode voltage is adjusted to the value between cathode and dynode No. 1 voltage that produces maximum current amplification; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode.
t At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 230 amperes per lumen.
u Supply voltage (E) across voltage divider providing ¼ of E between cathode and dynode No. 1; ⅛ of E for each succeeding dynode stage; and ⅛ of E between dynode No. 6 and anode.
v At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 0.3 ampere per lumen.
w Supply voltage (E) across voltage divider providing 1/6 of E between cathode and dynode No. 1; 1/12 of E for each succeeding dynode stage; and 1/12 of E between dynode No. 10 and anode.
x At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 7.5 amperes per lumen.
y At 25° C and with supply voltage (E) adjusted to give radiant sensitivity of 7200 amperes per watt.
z Watts.
∝ At 25° C and with supply voltage (E) adjusted to give luminous sensitivity of 6000 amperes per lumen.

QUICK SELECTION CHARTS FOR RCA PHOTOTUBES

MULTIPLIER PHOTOTUBES

Type	Window			Cathode Material					Dynode Material			Number of Stages					Nominal Tube Diameter In.						Spectral Response
	0080	9741	SiO_2	Cs-Sb	Sb-K-Na-Cs	Cs-Bi	Ag-Bi-O-Cs	Ag-O-Cs	Cs-Sb	Ag-Mg	Cu-Be	6	9	10	12	14	¾	1	1½	2	3	5	
1P21	X			X					X				X					X					S-4
1P22	X					X			X				X					X					S-8
1P28		X		X					X				X					X					S-5
931A	X			X					X				X					X					S-4
2020	X			X							X			X						X			S-11
2067	X			X					X					X					X				S-11
4438	X			X					X					X					X				S-11
4439	X			X					X					X					X				S-11
4440	X			X					X					X					X				S-11
4441	X			X					X					X					X				S-11
5819	X			X					X					X						X			S-11
6199	X			X					X					X					X				S-11
6217	X						X		X					X						X			S-10
6328	X			X					X				X					X					S-4
6342A	X			X							X			X						X			S-11
6472	X			X					X				X					X					S-4
6655A	X			X					X					X						X			S-11
6810A	X			X							X					X				X			S-11
6903			X	X					X					X						X			S-13
7029	X			X					X					X					X				S-17
7046		X		X						X						X						X	Extended S-11
7102	X							X		X				X					X				S-1
7117	X			X					X				X					X					S-4
7200			X	X					X				X					X					S-19
7264	X			X						X						X				X			S-11
7265	X				X						X					X				X			S-20
7326	X				X					X				X						X			S-20
7746	X			X							X			X						X			S-11
7764	X			X							X	X					X						S-11
7767	X			X							X			X			X						S-11
7850	X			X							X				X					X			S-11
8053	X			X							X			X						X			S-11
8054	X			X							X			X							X		S-11
8055	X			X							X			X								X	S-11

PHOTODIODES

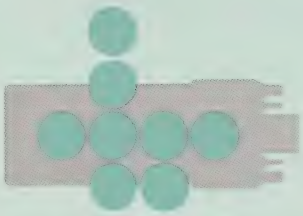
VACUUM TYPES

Type	Window				Cathode Material			Spectral Response
	0080	7052	9741	R6	Ag-O-Cs	Ag-O-Rb	Cs-Sb	
1P39	X						X	S-4
1P42		X					X	S-9
917	X				X			S-1
919	X				X			S-1
922	X				X			S-1
925	X				X			S-1
926	X					X		S-3
929	X						X	S-4
934				X			X	S-4
935			X				X	S-5
5652	X						X	S-4
5653	X						X	S-4
6570	X				X			S-1
7043	X						X	S-4

GAS TYPES

Type	Window		Cathode Material			Spectral Response
	0080	R6	Ag-O-Cs	Ag-O-Rb	Cs-Sb	
1P29	X			X		S-3
1P37	X				X	S-4
1P40	X		X			S-1
1P41		X	X			S-1
868	X		X			S-1
918	X		X			S-1
920	X		X			S-1
921	X		X			S-1
923	X		X			S-1
927		X	X			S-1
928	X		X			S-1
930	X		X			S-1
4409	X				X	S-4
5581	X				X	S-4
5582	X				X	S-4
5583		X			X	S-4
5584	X				X	S-4
6405/1640	X		X			S-1
6953	X		X			S-1

0080 Corning Lime Glass
R6 Kimble Standard Flint
9741 Corning Ultraviolet Transmitting Glass
7052 Corning Borosilicate Glass
SiO_2 Fused Silica



VACUUM PHOTODIODES

RCA Type	Description	Outline, Basing Diagram [a]	Spectral Response [b]	Wavelength of Max. Spectral Response angstroms	Interelectrode Capacitance μμf	Maximum Ratings [c]				Characteristics			
						Anode Supply Voltage dc or peak ac volts	Average Cathode-Current Density [d] μa/sq.in.	Average Cathode Current [d] μa	Ambient Temperature °C	Anode Supply Voltage dc volts	SENSITIVITY: Radiant [e] amp/watt	SENSITIVITY: Luminous [f] μa/lumen	Max. Anode Dark Current at 25° C. μa
1P39	Similar to 929 except has non-hygroscopic base.[g]	11	S-4	4000	2.6	250	25	5	75	250	0.044	45	0.005
1P42	Small, head-on type. For use where space is limited.	3	S-9	4800	0.9	180	25	0.4	75	180	0.025	37	0.005
917 919	Low-leakage types for light-measuring and relay applications.[h]	28	S-1	8000	2 2	500	30	10	100	250	0.0019	20	0.005
922	Cartridge type. For relay applications.	33	S-1	8000	1	500	30	5	100	250	0.0019	20	0.005
925	Short-bulb type. For relay applications.	9	S-1	8000	1.6	250	30	5	100	250	0.0019	20	0.0125
926	Cartridge type. For colorimetric applications.	34	S-3	4200	1	500	30	5	100	250	0.0019	6.5	0.005
929	For light-measuring and relay applications.	11	S-4	4000	2.6	250	25	5	75	250	0.044	45	0.0125
934	For sound and facsimile equipment.	5	S-4	4000	1.5	250	30	4	75	250	0.029	30	0.005
935	For ultraviolet measurement applications.	27	S-5	3400	0.6	250	30	10	75	250	0.043	35	0.0005
5652	Composite anode - cathode type with balancing capacitance. For facsimile service.	10	S-4	4000	1	250	30 [j]	4 [j]	75	250	0.044	45	0.01
5653	For relay applications.	11	S-4	4000	2.6	250	25	5	75	250	0.044	45	0.25
6570	For industrial applications critical as to microphonics and sensitivity gradient.	29	S-1	8000	3	500	25	5	100	250	0.0028	30	0.013
7043	Non-directional type. For sound reproduction.	16	S-4	4000	6	250	25	5	75	250	0.044	45	0.0125

a For Dimensional Outlines and Basing Diagrams, see pages 20 through 27.
b For Spectral Sensitivity Curves, see pages 18 and 19.
c Absolute values.
d Averaged over any interval of 30 seconds maximum.
e At wavelength of maximum spectral response for each type.
f On basis of tungsten-filament light source operated at 2870° K, dc anode supply voltage as indicated, and a 1-megohm load resistor.
g For applications critical as to leakage under high-humidity conditions.
h The 917 and 919 are alike except that 917 has anode connected to top cap, whereas 919 has cathode connected to top cap.
j For either electrode.

GAS PHOTODIODES

Type	Description	Outline, Basing Diagram [a]	Spectral Response [b]	Wavelength of Max. Spectral Response angstroms	Interelectrode Capacitance μμf	Maximum Ratings[c]				Characteristics				
						Anode Supply Voltage dc or peak ac volts	Average Cathode-Current Density [d] μa/sq.in.	Average Cathode Current [d] μa	Ambient Temperature °C	Anode Supply Voltage dc volts	SENSITIVITY: Radiant [e] amp/watt	SENSITIVITY: Luminous [f] μa/lumen	Max. Gas Amplification Factor	Max. Anode Dark Current at 25° C μa
1P29	For colorimetric applications.	23	S-3	4200	3	100	25[g]	5[g]	100	90	0.011	40	9.0	0.1
1P37	For sound reproduction from a dye-image sound track.	23	S-4	4000	3	100	25[g]	5[g]	75	90	0.13	135	5.5	0.05
1P40	Similar to 930 except has non-hygroscopic base.[h]	11	S-1	8000	2.4	90	30[j]	3[j]	100	90	0.013	135	10.0	0.005
1P41	End type (head-on operation). For relay applications.	4	S-1	8000	1.8	90	20[j]	1.5[j]	100	90	0.0084	90	8.5	0.1
868	For sound reproduction.	23	S-1	8000	3	100	25[g]	5[g]	100	90	0.0084	90	8.0	0.1
918	For sound reproduction.	23	S-1	8000	3	90	25[j]	5[j]	100	90	0.014	150	10.5	0.1
920	Twin type. For push-pull sound reproduction from a double sound track.[k]	22	S-1	8000	0.44	90	15[j]	2[j]	100	90	0.0094	100	9.0	0.1
921	Cartridge type. For relay applications.	34	S-1	8000	1	90	30[j]	3[j]	100	90	0.013	135	10.0	0.01
923	For renewal use. In new equipment design, use 1P40 or 930.	21	S-1	8000	2	90	30[j]	3[j]	100	90	0.013	135	10.0	0.1
927	For 16-mm sound equipment.	5	S-1	8000	2	90	30[j]	2[j]	100	90	0.012	125	10.0	0.1
928	Non-directional type. For relay applications.	17	S-1	8000	3	90	30[j]	3[j]	100	90	0.0061	65	10.0	0.1
930	For sound reproduction and relay applications.	11	S-1	8000	2.4	90	30[j]	3[j]	100	90	0.013	135	10.0	0.1
4409	Unobstructed cathode area. For colorimetric and sound reproduction applications.	15	S-4	4000	2.4	100	30[g]	3[g]	75	90	0.13	135	5.5	0.050
5581	For sound reproduction involving a dye-image sound track in conjunction with an incandescent light source.	11	S-4	4000	2.6	100	30[g]	3[g]	75	90	0.13	135	5.5	0.05
5582		33	S-4	4000	2.2	100	20[g]	2[g]	75	90	0.12	120	5.5	0.05
5583		5	S-4	4000	2	100	20[g]	2[g]	75	90	0.13	135	5.5	0.05
5584[k]		22	S-4	4000	0.44	100	10[g]	2[g]	75	90	0.12	120	5.5	0.05
6405/1640	For industrial applications critical as to microphonics and sensitivity gradient.	29	S-1	8000	3	90	25[j]	5[j]	100	50	0.0033	35	2.5	0.1
6953	Unobstructed cathode area. For sound reproduction.	15	S-1	8000	3	90	30[j]	3[j]	100	90	0.019	200	10.0	0.1

a For Dimensional Outlines and Basing Diagrams, see pages 20 through 27.
b For Spectral Sensitivity Curves, see pages 18 and 19.
c Absolute values.
d Averaged over any interval of 30 seconds maximum.
e At wavelength of maximum spectral response for each type.
f On basis of tungsten-filament light source operated at 2870° K, dc anode supply voltage as indicated, and a 1-megohm load resistor.
g May be doubled when anode supply voltage is limited to 80 volts.
h For applications critical as to leakage under high-humidity conditions.
j May be doubled when anode supply voltage is limited to 70 volts.
k Values shown for this type are for each unit.

RECOMMENDED IMAGE-CONVERTER TUBES

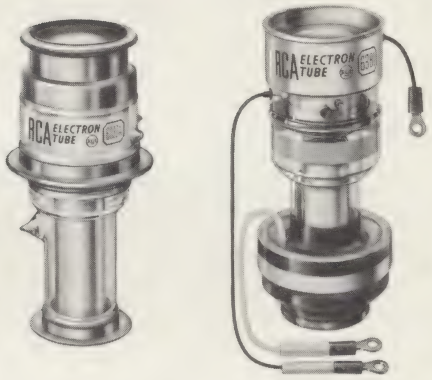
FOR IR APPLICATIONS

RCA-6032A—For use in combination with suitable optical systems in viewing a scene with near-infrared radiation. Electrostatic focus. Has S-1 spectral response; P20 phosphor screen. Is controlled for threshold visibility. Max. length is $4\frac{17}{32}$″ and max. diameter is $2\frac{1}{8}$″.

RCA-6381—For use in combination with suitable optical systems in viewing a scene with near-infrared radiation. Electrostatic focus. Has S-1 spectral response; P20 phosphor screen. Supplied with semiflexible leads and integral optical lens coupled to phosphor screen faceplate. Max. length is $4\frac{25}{32}$″ and max. diameter is 2.115″.

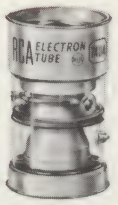
RCA-6914 · 6914A—Self-focusing monovoltage types. For use with suitable optical systems for viewing scenes with near-infrared radiation. The 6914A, which is unilaterally interchangeable with the 6914, is controlled for threshold visibility. Have S-1 spectral response; P20 phosphor. Max. length is 2.97″ and max. diameter is 1.91″.

RCA-6929—Self-focusing monovoltage type. For use with suitable optical systems for viewing scenes with near-infrared radiation. Has S-1 spectral response; P20 phosphor. Max. length is 2.33″ and max. diameter is 1.38″.



FOR UV APPLICATIONS

RCA-7404—Self-focusing, monovoltage type. For use with suitable optical systems for viewing objects irradiated with near-ultraviolet radiation. Has S-21 spectral response; P20 phosphor. Spectral response covers range from about 2350 to 6200 angstroms. Max. length is 2.33″ and max. diameter, excluding side tip, is 1.38″.



FOR PHOTOGRAPHIC SHUTTER SERVICE

RCA-4449—A high-speed, electrostatically-focused-and-deflected light shutter type for imaging single or multiple images. Has a shutter speed capability as short as 10^{-8} second. Is provided with P11 phosphor screen and has S-11 spectral response. Max. length is 9.93″ and max. diameter, excluding side tip, is 4.04″. Features include—

- *Minimum resolution of 17 line-pairs/mm*
- *Low distortion of deflected images*
- *Very fast shutter speed capability*

IMAGE-CONVERTER TUBES

RCA Type	Out-line, Basing Dia-gram a	Deflection and/or Focus	Maximum Dimensions		Spectral Response b	Screen Phosphor b	Average Characteristics at 25° C					
			Diameter	Length			Supply Voltage	Minimum Radiant Power Conversion Gain c	Minimum Infrared Conversion Index d	Equiv. Screen Background Input e	Magni-fication Factor	Minimum Cathode Resolution f
			inches	inches			kv			watts/sq. cm		line-pairs/mm
4449	48	E	4.04g	9.93	S-11	P11	15	50	—	5×10^{-12}	0.77	17
6032A	43	E	2⅛	4 17/32	S-1	P20	20	—	10	—	0.5	18
6381	44	E	2.115	4 25/32	S-1	P20	16	—	10	—	0.58	25
6914 6914A	45	E	1.91	2.97	S-1	P20	16	—	15	—	0.76	25
6929	46	E	1.38	2.33	S-1	P20	12	—	10	—	0.75	25
7404	47	E	1.38g	2.33	S-21	P20	12	—	—	1×10^{-10}	0.75	25

a For Dimensional Outlines and Basing Diagrams, see pages 28 and 29.

b For Spectral Sensitivity Curves and Spectral Energy Emission Curves, see page 19.

c Radiant Power Conversion Gain is defined as the quotient of the total output power from the fluorescent screen by the incident radiant power at 4400 angstroms.

d Ratio of light flux from fluorescent screen to the product of the light flux incident on the infrared filter multiplied by the filter factor.

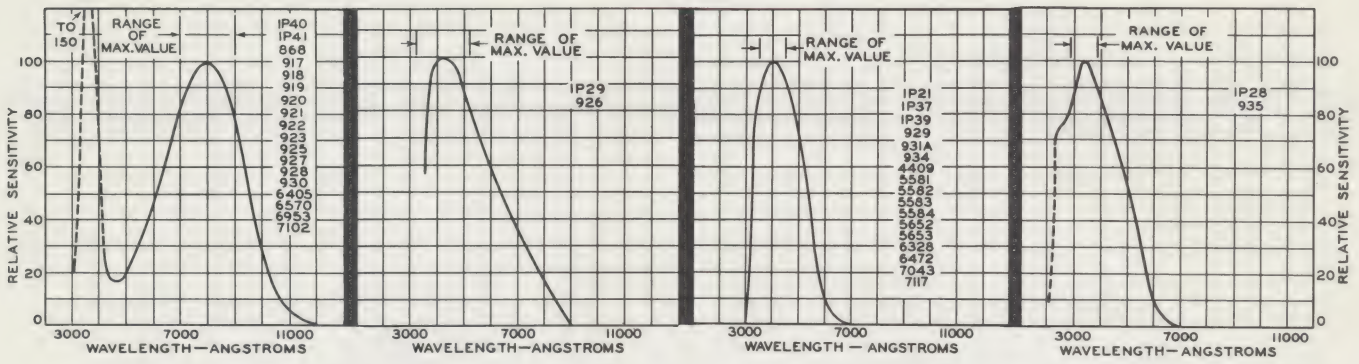
e Defined as that value of incident radiation required to cause an increase in screen brightness equal to the screen background brightness.

f Screen Resolution is equal to cathode resolution divided by magnification factor.

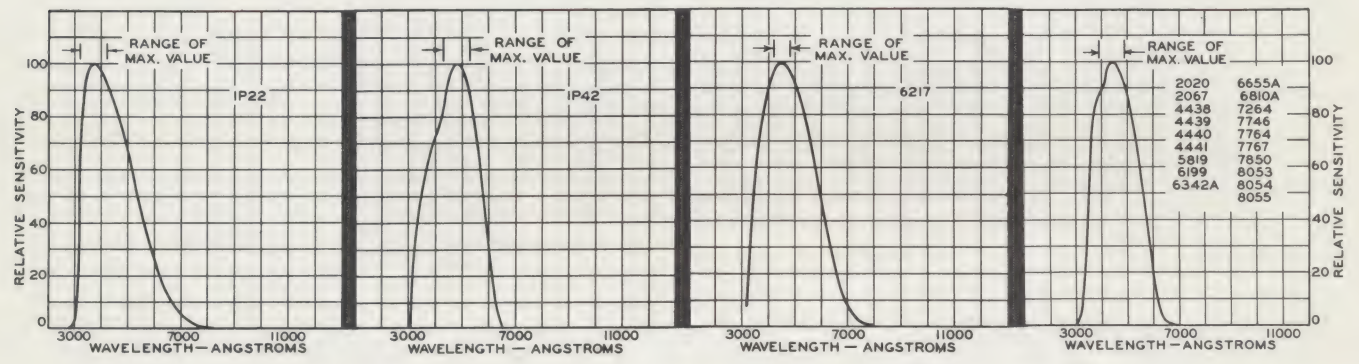
g Exclusive of exhaust tip.

SPECTRAL-SENSITIVITY CURVES

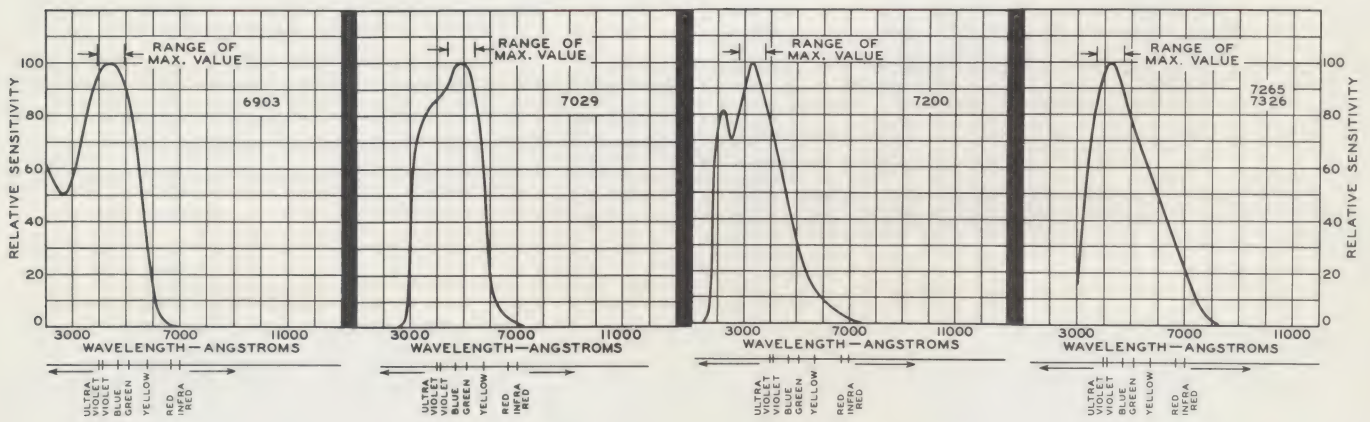
PHOTOTUBES



S-1 S-3 S-4 S-5

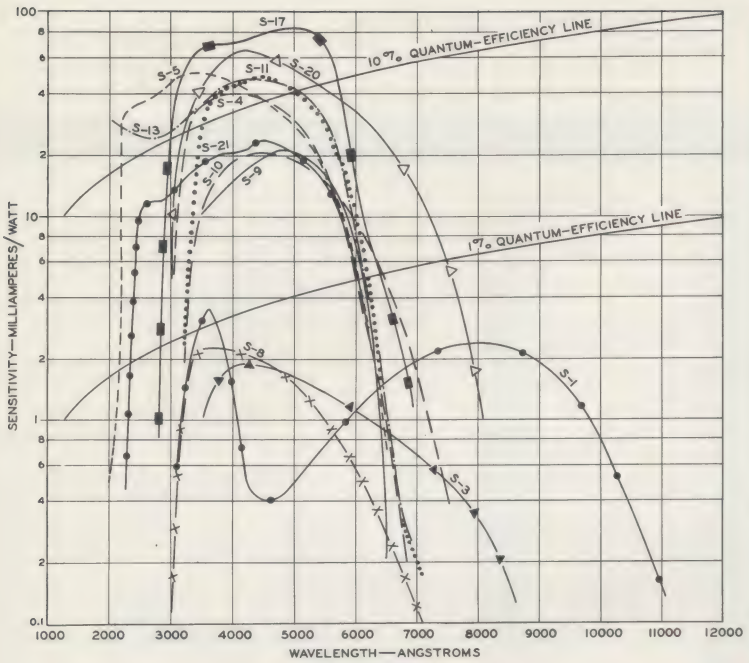


S-8 S-9 S-10 S-11



S-13 S-17 S-19 S-20

The spectral responses of photosensitive devices are ordinarily indicated by S-designations and are shown in the curves on these pages. These curves are for equal values of radiant flux at all wavelengths and generally give spectral sensitivity in relative units for the types listed on each curve. In order to compare the sensitivity of one type with that of another, the relative scale values should be converted to absolute values as follows; set the 100-unit value of the sensitivity scale equal to the radiant-sensitivity value (amp/watt) which is obtained for each type to be compared from the page containing the data for the specific type. Other radiant-sensitivity values on the curve may then be determined by reading values on the relative scale as percentages of the 100-unit radiant value.



TYPICAL ABSOLUTE SPECTRAL SENSITIVITY CHARACTERISTICS

These response curves are based on average values of cathode radiant sensitivity for the different photocathode-window materials. Absolute values of spectral response in amperes per watt at given wavelengths for a particular phototube may be determined as indicated on page 18.

Lines of constant quantum efficiency are shown on the graph. Quantum efficiency in per cent at any given wavelength can be calculated from the following formula:

$$QE = S_k \left(\frac{12395}{\lambda_x}\right)(100)$$

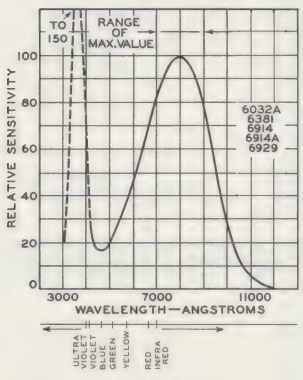
where QE is the quantum efficiency in per cent at λ_x

S_k is the cathode radiant sensitivity at λ_x in amperes/watt

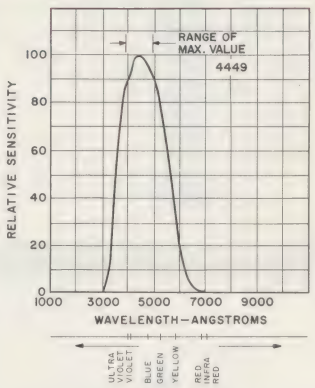
λ_x is the wavelength in angstroms

SPECTRAL-SENSITIVITY CURVES

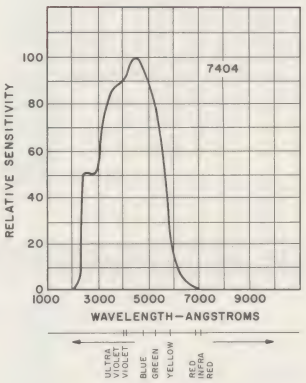
IMAGE-CONVERTER TUBES



S-1

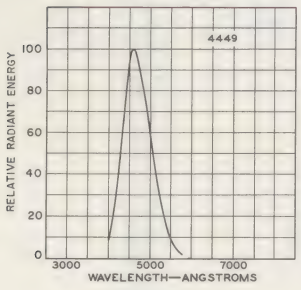


S-11



S-21

SPECTRAL-ENERGY-EMISSION CURVES



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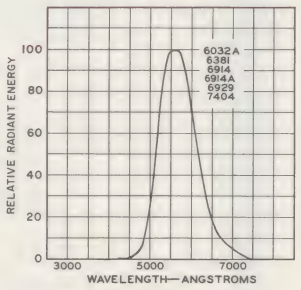

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DIMENSIONAL OUTLINES AND BASING DIAGRAMS

For Key to Base and Envelope Connection Diagrams, See Page 2

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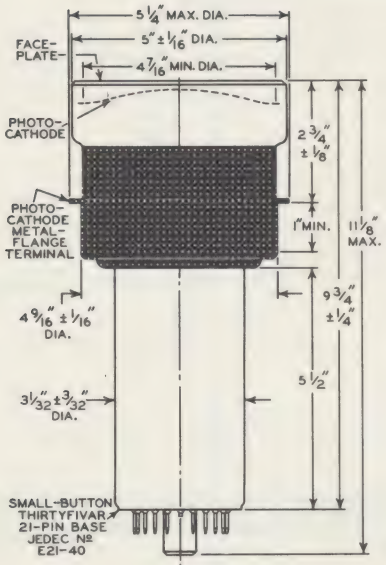

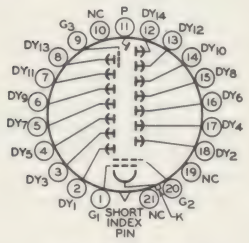

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7046

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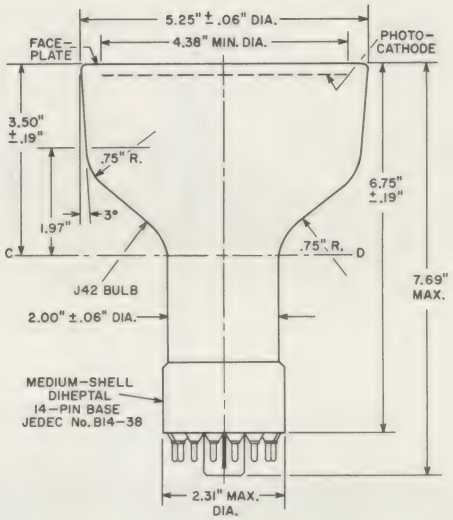

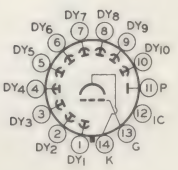

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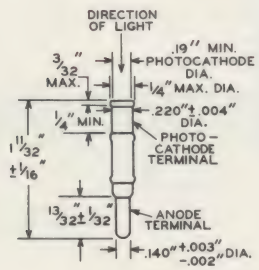

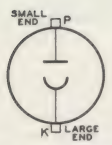

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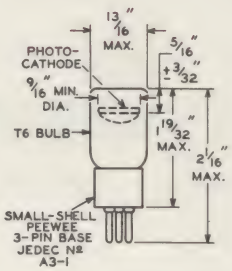

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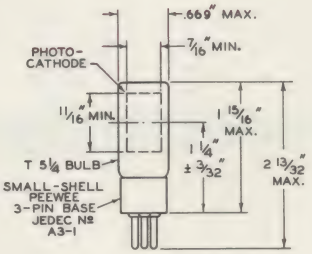

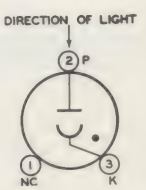

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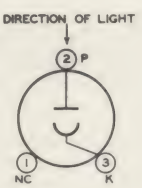

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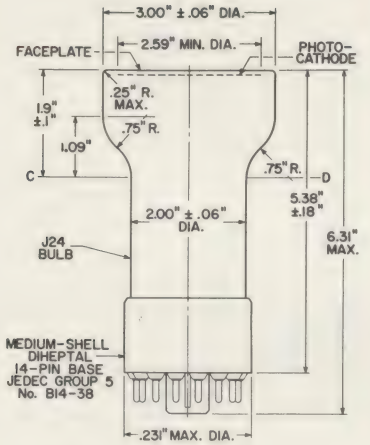

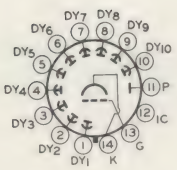

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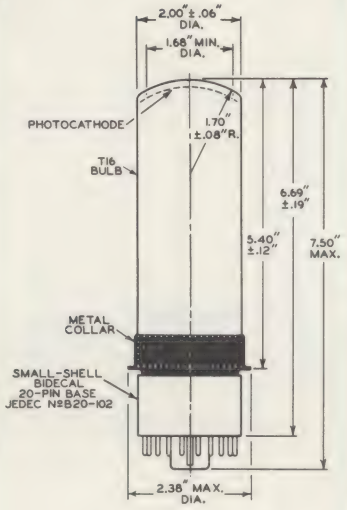

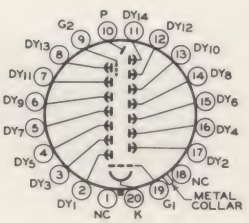

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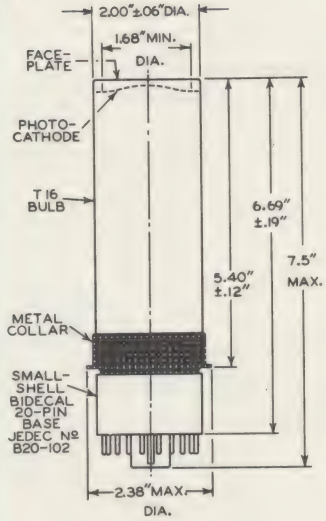

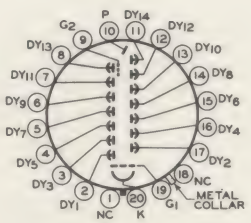

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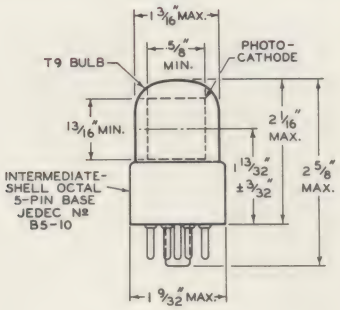

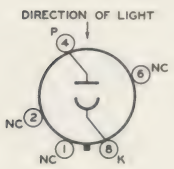

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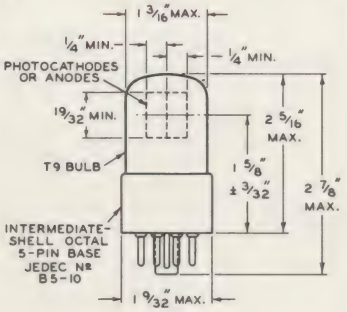

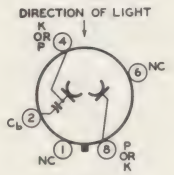

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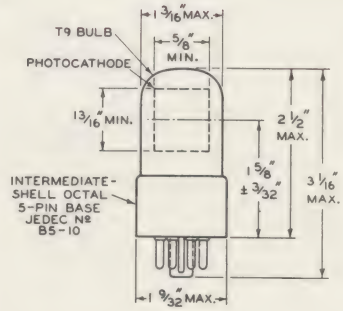

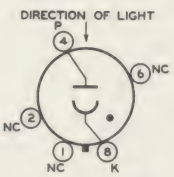

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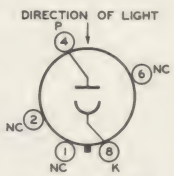

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DIMENSIONAL OUTLINES AND BASING DIAGRAMS

For Key to Base and Envelope Connection Diagrams, See Page 2

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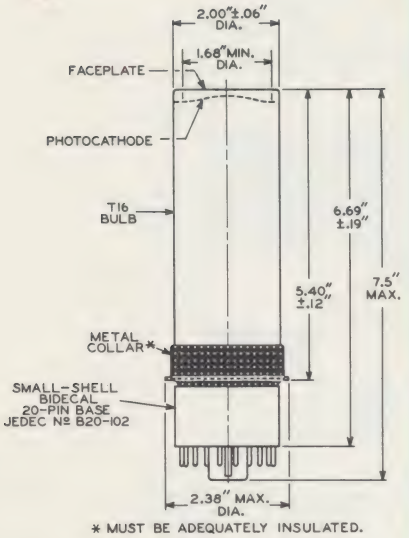

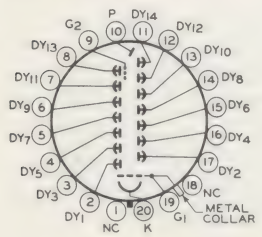

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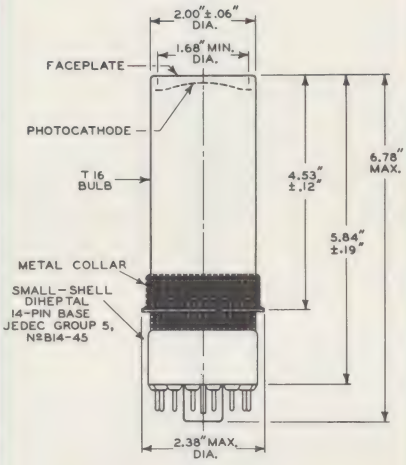

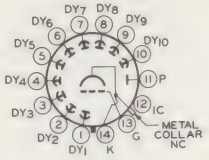

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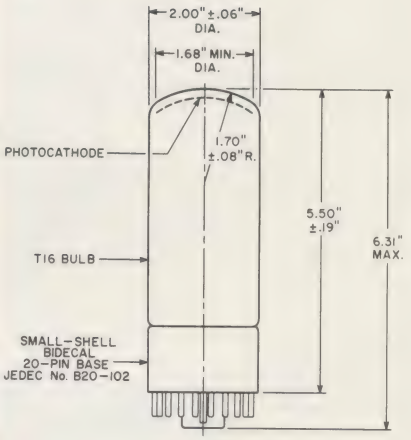

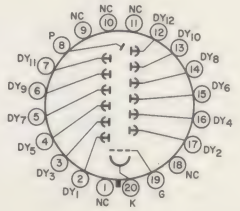

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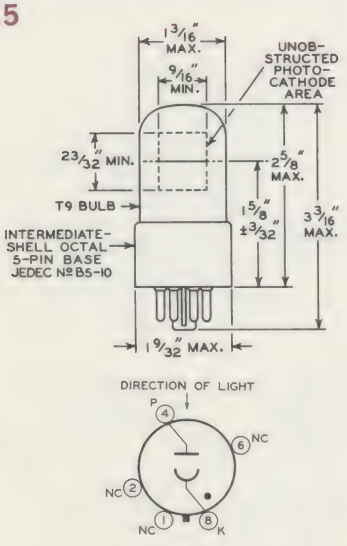

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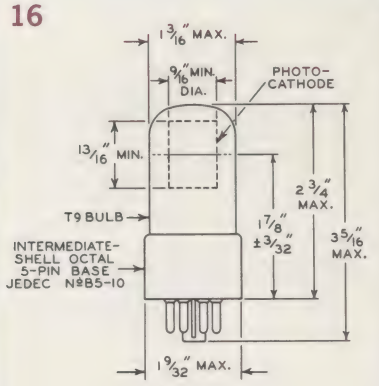

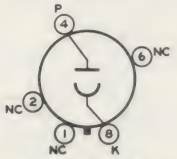

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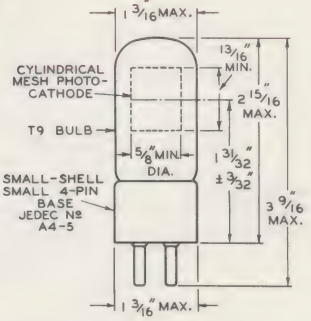

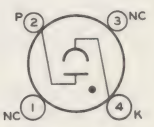

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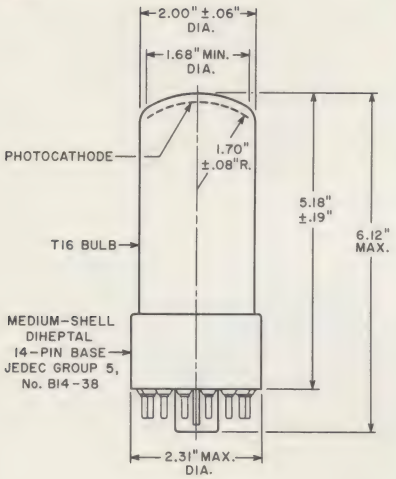

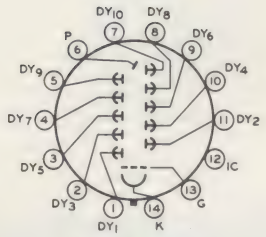

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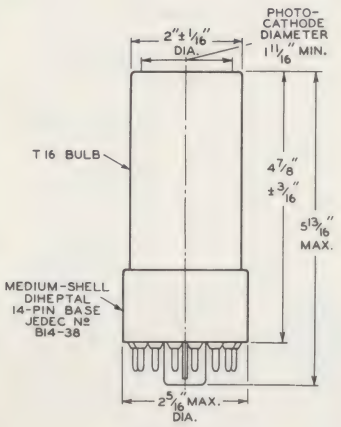

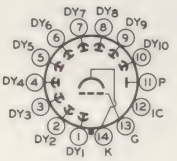

See Note 1, page 27
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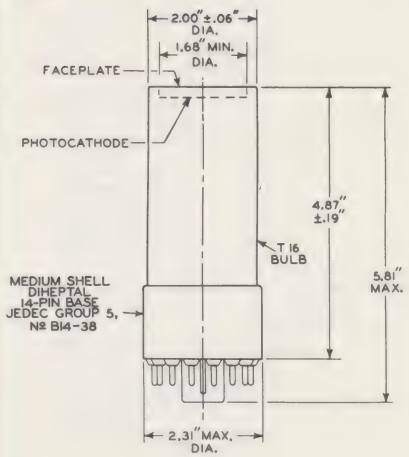

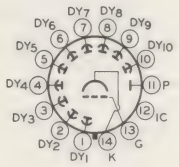

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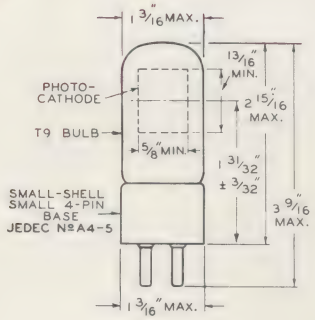

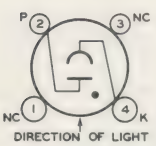

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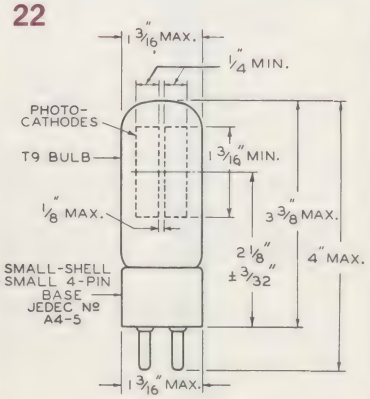

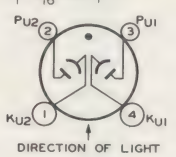

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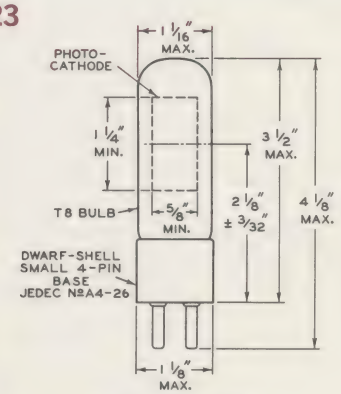

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DIMENSIONAL OUTLINES AND BASING DIAGRAMS

For Key to Base and Envelope Connection Diagrams, See Page 2

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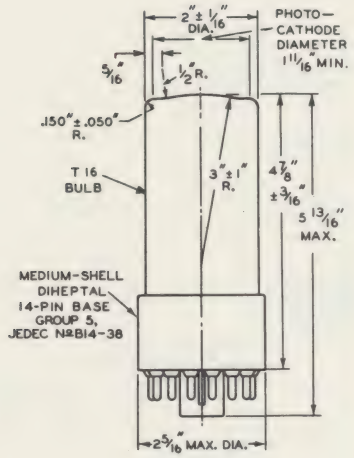

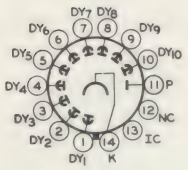

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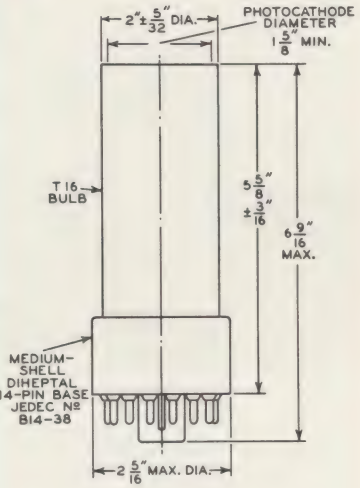

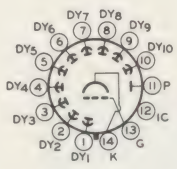

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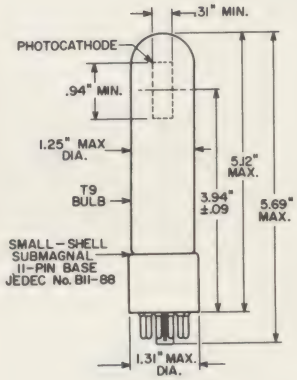

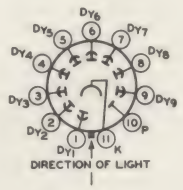

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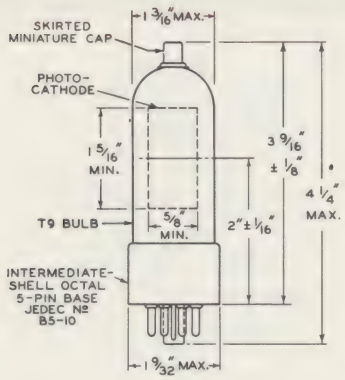

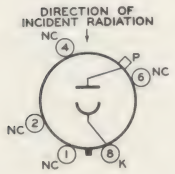

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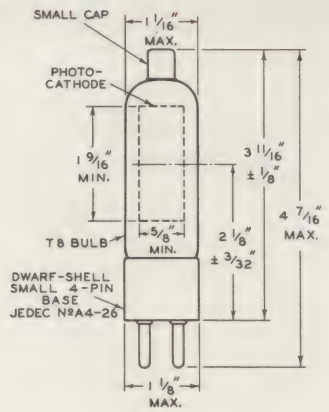

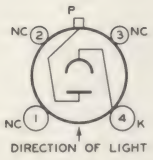

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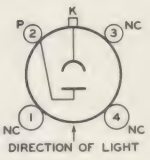

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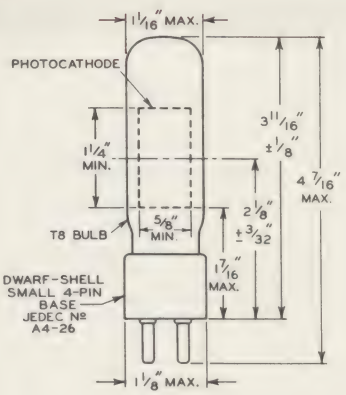

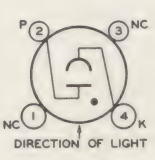

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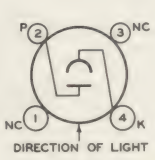

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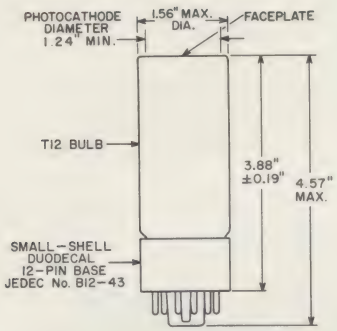
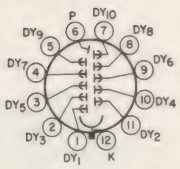
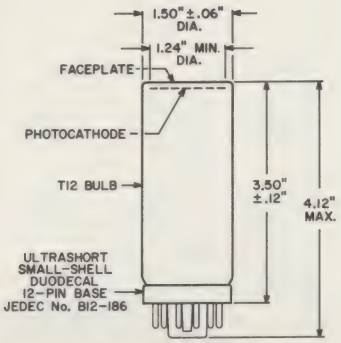
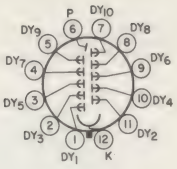




See Note 1, page 27
6199 7102

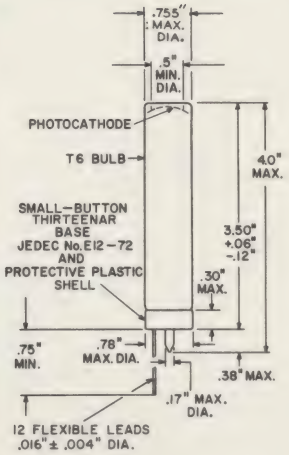
31

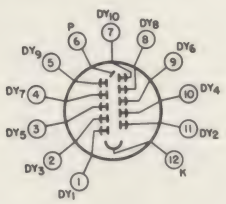




See Note 1, page 27
4440

32





See Note 1, page 27
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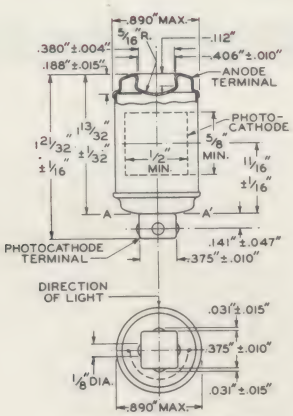
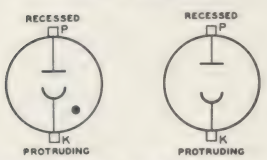


A-A'=PLANE PERPENDICULAR TO AXIS OF TUBE

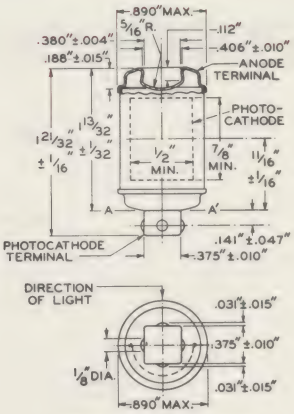


See Note 4, page 27
5582

See Note 4, page 27
922*

*Has overall length of $1\frac{21}{32}" + \frac{1}{32}" - \frac{1}{16}"$

34



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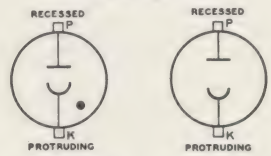


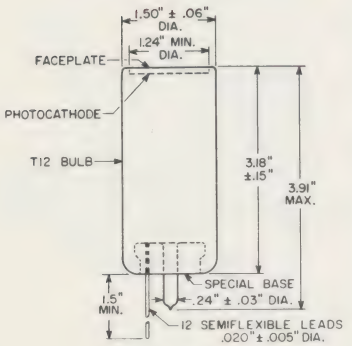
See Note 4, page 27
921

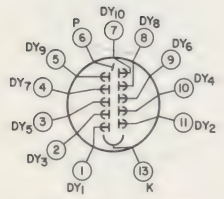
See Note 4, page 27
926

DIMENSIONAL OUTLINES AND BASING DIAGRAMS

For Key to Base and Envelope Connection Diagrams, See Page 2

35



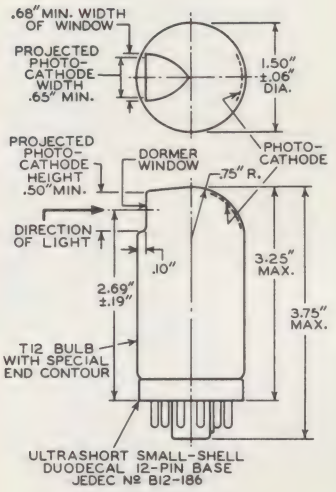


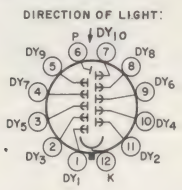
See Note 1, page 27

4438 4439*

*The 4439 is supplied with base attached to semiflexible leads

36

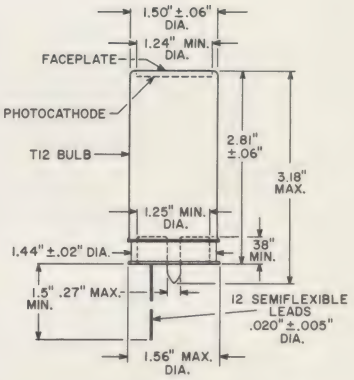


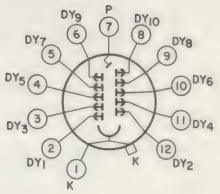


See Note 3, page 27

7029

37





See Note 1, page 27

4441

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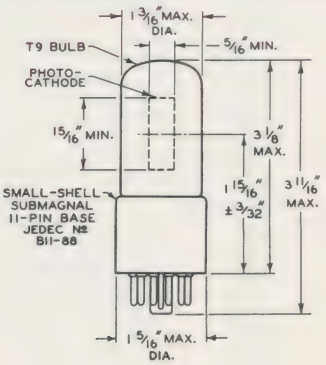
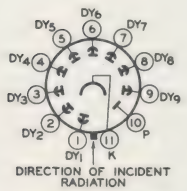
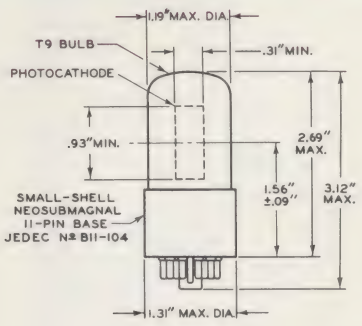
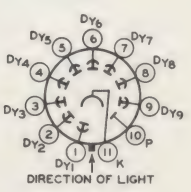




1P21 1P22 1P28 931A

39

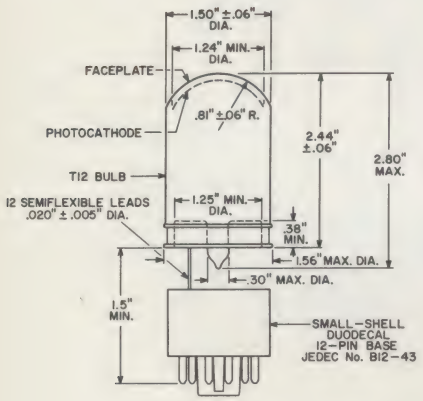


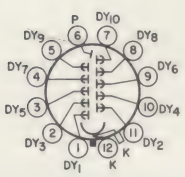


6328 7117

Note 1: Direction of radiation is into end of bulb.
Note 2: Direction of light is perpendicular to axis of photocathode.
Note 3: Direction of light is into dormer window.
Note 4: Direction of light is into concave side of photocathode.

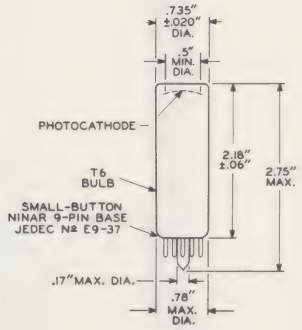
40

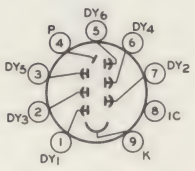




See Note 1, page 27
2067

41





See Note 1, page 27
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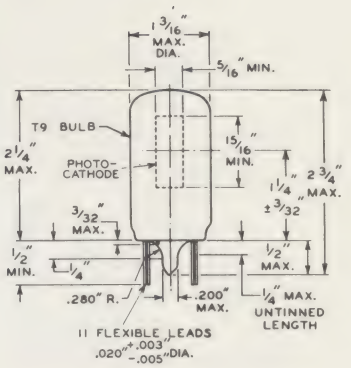
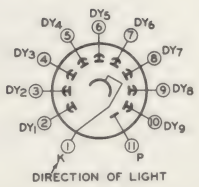
42





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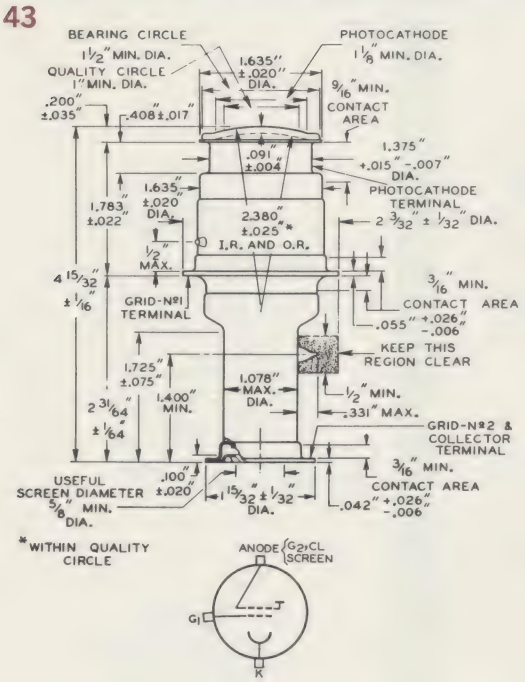
DIMENSIONAL OUTLINES AND BASING DIAGRAMS

For Key to Base and Envelope Connection Diagrams, See Page 2

43



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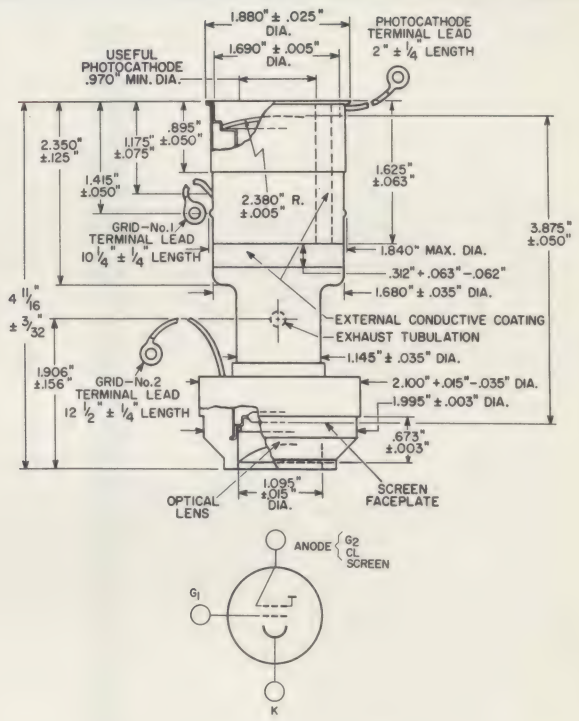

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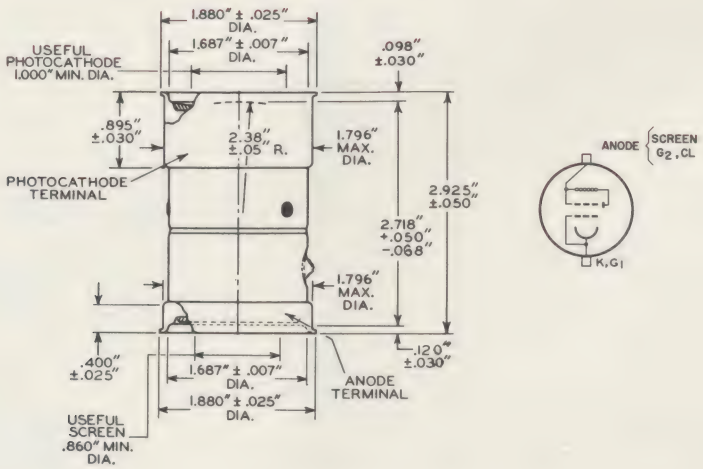

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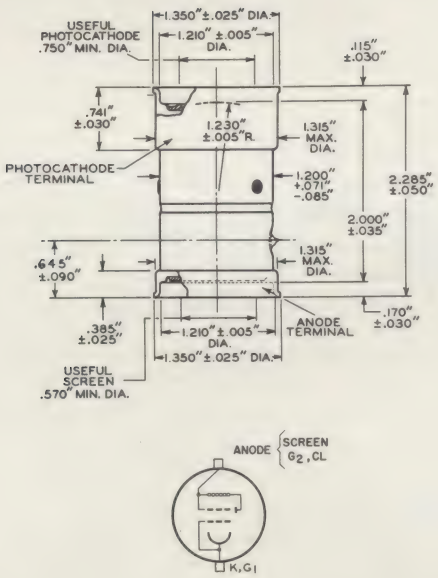

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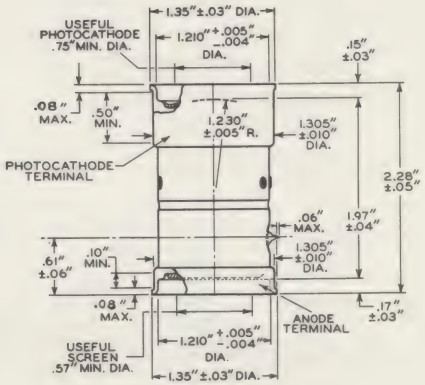

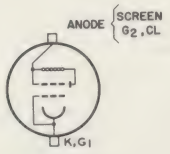

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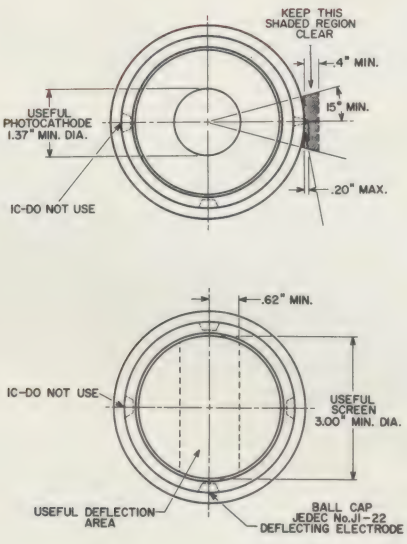

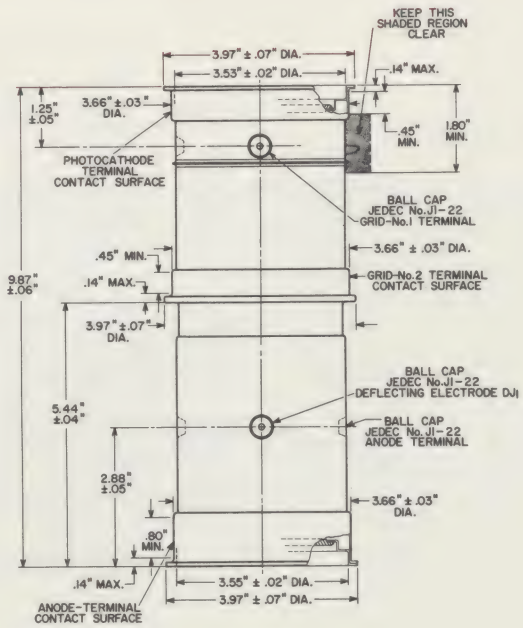

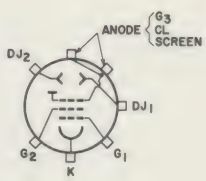

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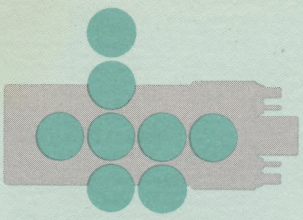

SOCKETS AND SHIELDS FOR RCA PHOTOTUBES

RCA Type	Socket Part No.[a]	Magnetic Shield Part No.[a]	RCA Type	Socket Part No.[a]	Magnetic Shield Part No.[a]
1P21	Cinch No. 13787	JAN No. S-1562	5582	Amphenol No. 146-121	—
1P22	Cinch No. 13787	JAN No. S-1562	5583	Amphenol No. 78S3S	—
1P28	Cinch No. 13787	JAN No. S-1562	5584	Cinch No. 2154	—
1P29	Amphenol No. 77MIP4T	—	5652	Amphenol No. 77MIP8T	—
1P37	Amphenol No. 77MIP4T	—	5653	Amphenol No. 77MIP8T	JAN No. S-1181
1P39	Loranger No. 1935	JAN No. S-1181	5819	Amphenol No. 59-417	JAN No. S-2004
1P40	Loranger No. 1935	JAN No. S-1181	6199	Eby No. 9058	JAN No. S-1561
1P41	Amphenol No. 78S3S	—	6217	Loranger No. 2274	JAN No. S-2004
1P42	—	—	6328	Amphenol No. 77MIP11T	Millen No. 80801B
868	Johnson No. 122-224-100	—	6342A	Loranger No. 2274	Millen No. 80802B
917	Loranger No. 2093	—	6405/1640	Cinch No. 2154	—
918	Loranger No. 2093	—	6472	Has semiflexible leads	—
919	Loranger No. 2093	—	6570	Loranger No. 2093	—
920	Loranger No. 2093	—	6655A	Amphenol No. 59-417	JAN No. S-2004
921	Amphenol No. 146-121	—	6810A	Eby No. 9778-1	Millen No. 80802E
922	Amphenol No. 146-121	—	6903	Amphenol No. 59-417	Millen No. 80802B
923	Amphenol No. 77MIP4T	—	6953	Loranger No. 1935	—
925	Eby No. 9729-127	—	7029	Amphenol No. 59-402	—
926	Amphenol No. 146-121	—	7043	Johnson No. 122-228-200	—
927	Amphenol No. 78S3S	—	7046	Alden No. 435SBA	Millen No. 80805P
928	Loranger No. 2093	—	7102	Eby No. 9058	JAN No. S-1561
929	Cinch No. 9875	JAN No. S-1181	7117	Cinch No. 13787	JAN No. S-1562
930	Cinch No. 9875	JAN No. S-1191	7200	Cinch No. 13787	—
931A	Cinch No. 13787	JAN No. S-1562	7264	Eby No. 9778-1	Millen No. 80802E
934	Amphenol No. 78S3S	—	7265	Eby No. 9778-1	Millen No. 80802E
935	Cinch No. 9875	—	7326	Amphenol No. 59-417	JAN No. S-2002
2020	Eby No. 9709-7	Millen No. 80802B	7746	Amphenol No. 59-417	JAN No. S-2004
2067	Has semiflexible leads	—	7764	Garlock No. 69005-7957	—
4409	Loranger No. 1935	—	7767	Has semiflexible leads	—
4438	Has semiflexible leads	—	7850	Eby No. 9778-1	—
4439	Amphenol No. 59-402	—	8053	Cinch No. 9463-14	JAN No. S-2004
4440	Amphenol No. 59-402	Millen No. 80802C	8054	Cinch No. 9463-14	Millen No. 80803J
4441	Has semiflexible leads	—	8055	Cinch No. 9463-14	JAN No. S-5018
5581	Loranger No. 1935	JAN No. S-1181			

[a]Or equivalent.

SOCKET MANUFACTURERS

Alden Products Company
9140 North Main Street
Brockton 64, Massachusetts

Amphenol Electronics Corporation
1830 South 54th Avenue
Chicago 50, Illinois

Cinch Manufacturing Company
1026 South Homan Avenue
Chicago 24, Illinois

Hugh H. Eby Company
4701 Germantown Avenue
Philadelphia 44, Pennsylvania

Garlock Inc.
602 North 10th Street
Camden 2, New Jersey

E. F. Johnson Company
Waseca, Minnesota

Loranger Manufacturing Corp.
36 Clark Street
Warren, Pennsylvania

MAGNETIC SHIELD MANUFACTURERS

James Millen Manufacturing Company
150 Exchange Street
Malden 48, Massachusetts

JAN Hardware Manufacturing Company
38-01 Queens Blvd.
Long Island City 1, New York

RCA Field Sales & Engineering personnel who service the sales and promotion of RCA Industrial Tube Products to Equipment Manufacturers, Government Activities, and Distributor Markets are available at the following office locations:

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RAymond 3-8361

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*Engineering personnel are available for consultation at these Distributor Sales offices.

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In addition to the electron devices covered in this booklet, the ELECTRON TUBE DIVISION of the RADIO CORPORATION of AMERICA offers the following:

RECEIVING TUBES FOR ENTERTAINMENT USE

Rectifiers, Diode Detectors, Converters, Voltage and Power Amplifiers, Oscillators, Mixers, and Picture Tubes for B&W and Color TV.

CAMERA TUBES

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STORAGE and CATHODE-RAY TUBES

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RECEIVING-TYPE INDUSTRIAL TUBES

Nuvistor Tubes, Premium Tubes, Special-Red Tubes, Computer Tubes, Glow-Discharge Tubes, Small Thyratrons, Vacuum-Gauge Tubes, and other Special Types.

SEMICONDUCTOR PRODUCTS

Transistors, Silicon Rectifiers, Semiconductor Diodes, Micromodules, and other Microelectronic Products.

POWER TUBES

Vacuum Power Tubes, Rectifier Tubes, Thyratrons, and Ignitrons.

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Magnetrons, Traveling-Wave Tubes, Pencil Tubes, and Solid-State Oscillators and Amplifiers.

TEST AND MEASURING EQUIPMENT

For AM, FM, and TV Servicing as well as for Laboratories and Industrial Use.

DRY BATTERIES

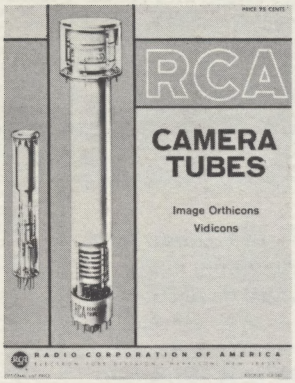
For Electron-Tube and Transistor Radios, Flashlights, Electronic Toys, Photoflash Equipment, and Industrial Applications.

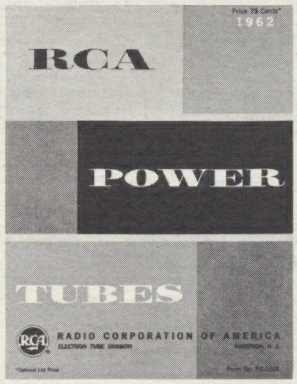
AUDIO DEVICES AND TV ACCESSORIES

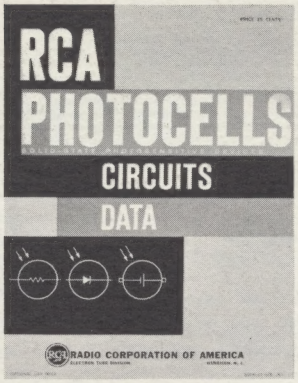
Magnetic Recording Sound Tape and Accessories, TV-Set Couplers and Lightning Arrestors.

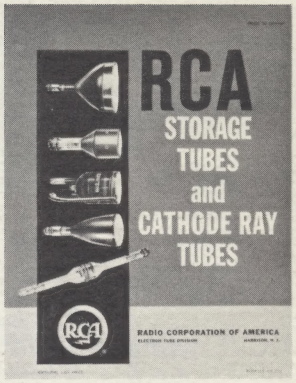
For a complete listing of these RCA products, or for technical information on these items, see your RCA Tube Distributor, or write to Commercial Engineering, RCA, Harrison, New Jersey.

Technical Information is available from the above office locations, your RCA Tube Distributor, or by writing to: RCA Commercial Engineering, Harrison, New Jersey









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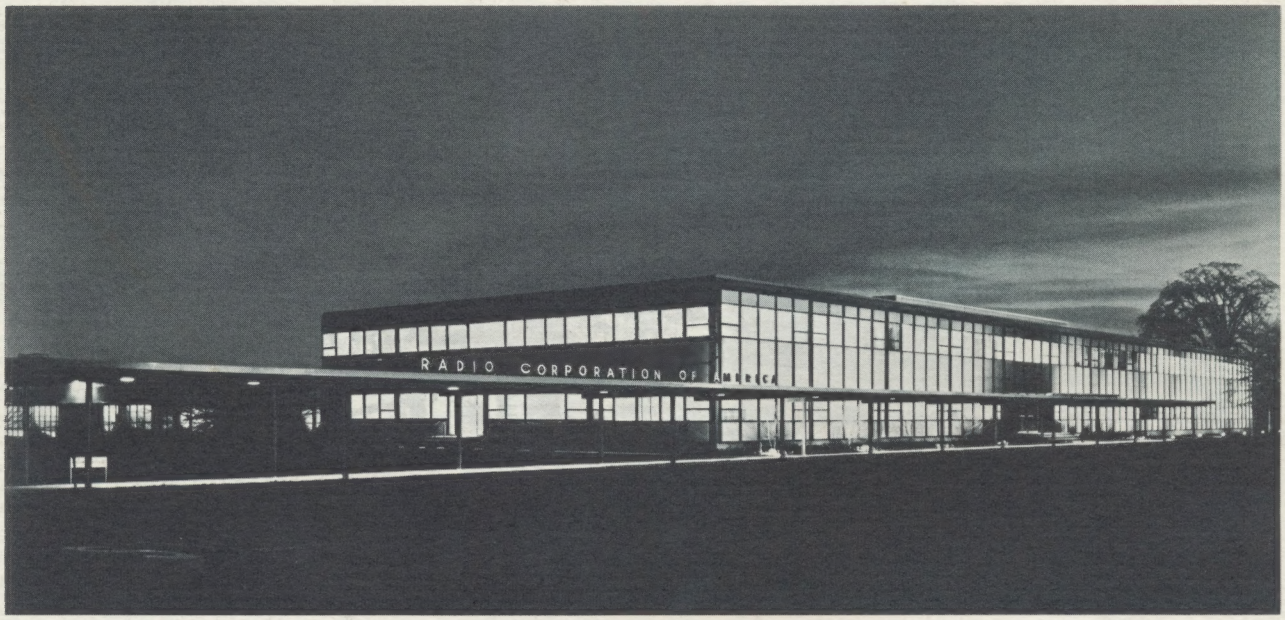

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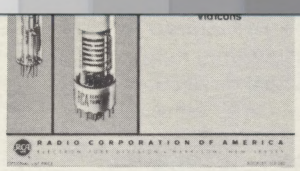

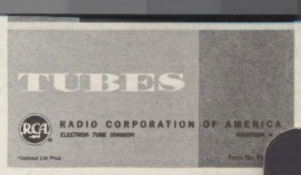

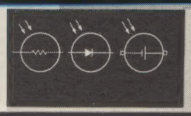

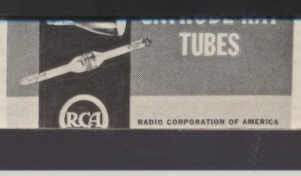

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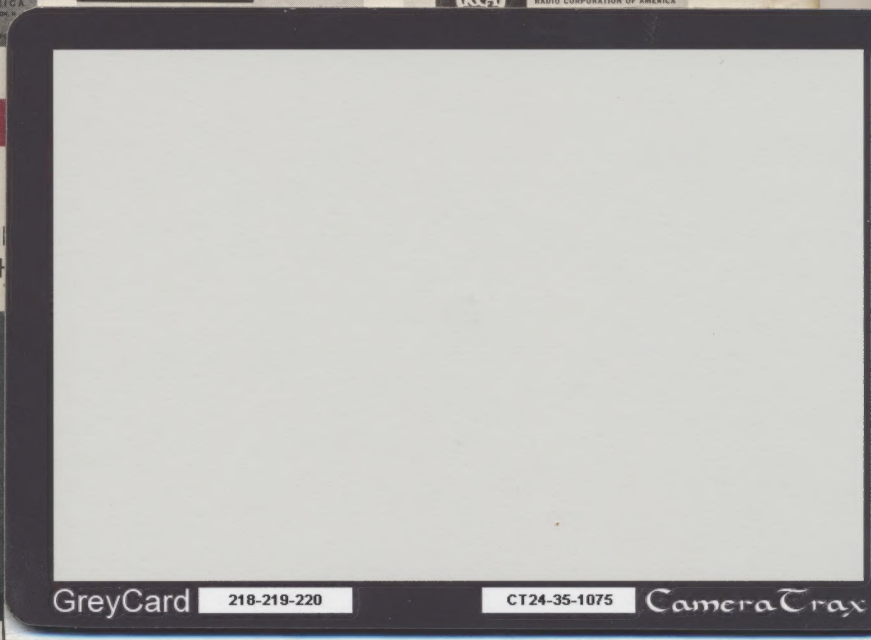

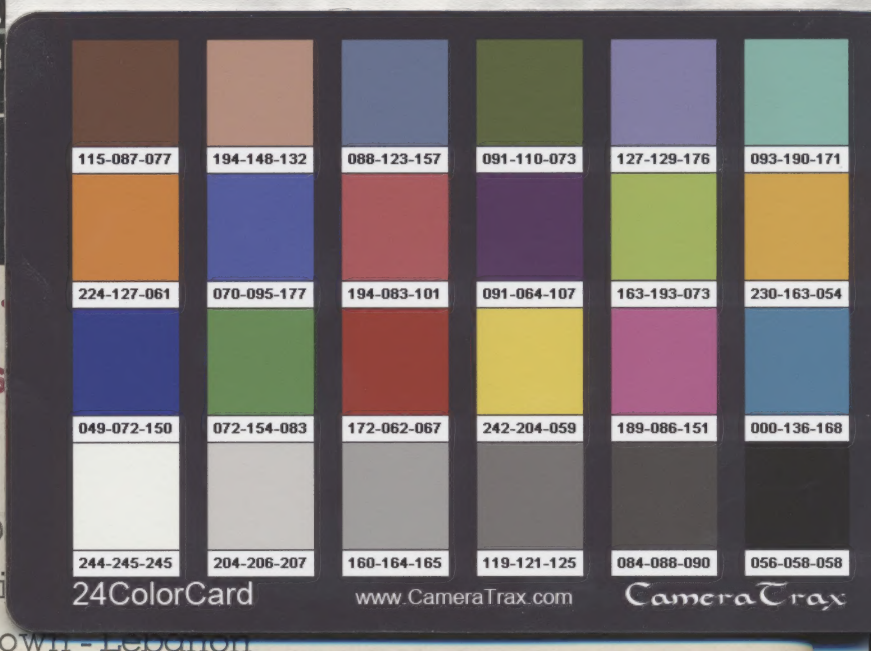

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